DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

FIVE DOLLARS PER YEAR

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LESS FUEL USED... LESS UPKEEP COST

Lubricate your Diesels with TEXACO URSA OILS

Texaco Ursa Oils are so far out in front because they are especially made to prevent oxidation and the formation of carbon, varnish, sludge and gum; because they take high temperatures and pressures "in stride" . . . keep rings free . . . ports clear . . . valves active.

All this adds up to more efficient operation, less fuel consumption, lower maintenance costs. No wonder leading Diesel engine builders approve *Texaco Ursa Oils* . . . no wonder operators prefer them.

When selecting Diesel lubricating oil, remember this fact — *more stationary Diesel horsepower in the United States is lubricated with Texaco Ursa Oils than with any other brand!*

Let a Texaco Lubrication Engineer show you how *Texaco Ursa Oils* can step up *your* Diesel efficiency. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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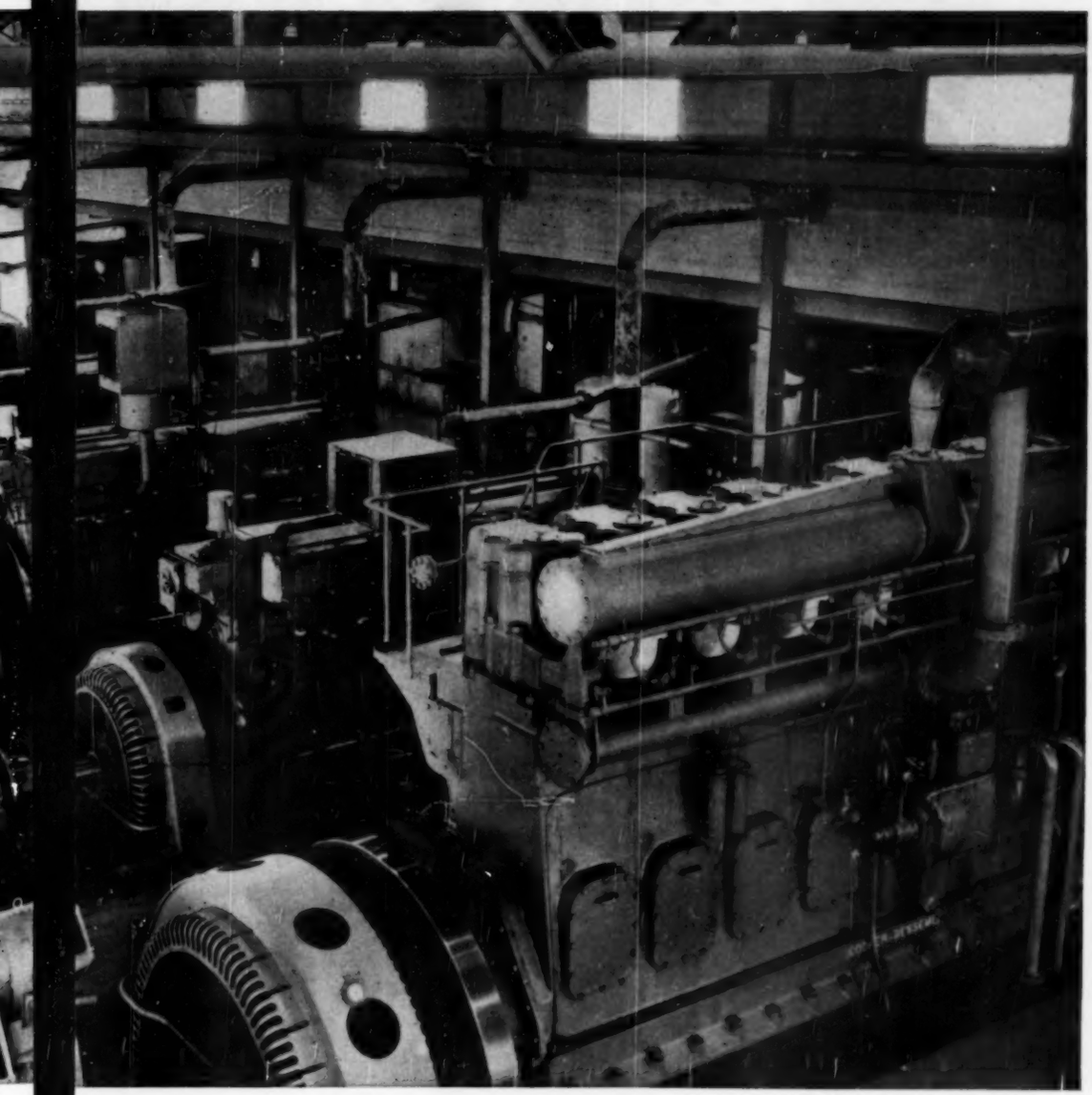


URSA OILS

FOR ALL DIESEL ENGINES

"Can I use

You have heard a lot about diesels and how much they reduce costs. But can you yourself use them?

Herein is a frank explanation of the practical economy of the diesel-powered truck—who can profit by it, and who cannot.

Mack is the oldest manufacturer of commercial vehicles in the United States and one of the foremost manufacturers of gasoline-powered trucks. Mack has also built more diesel-powered trucks than any other manufacturer in the world. Because we build both gasoline- and diesel-powered trucks, we can give an honest opinion about the value of the diesel for your needs . . . and the needs of industry in its search for new ways to cut transportation costs. The diesel, today, promises the only way out for thousands of truck owners. That is the reason for this message.

Question: *Why has the diesel engine been the subject of so much experiment? Millions have been spent—for years—on its improvement.*

Answer: The prize is worth the race. The diesel engine is capable of converting a greater percentage of the latent energy of the fuel into useful work than is any other kind of automotive powerplant. The gasoline engine is about 25 per cent efficient, the steam powerplant about 5 per cent, while the diesel is 35 per cent efficient. This means that the diesel engine has 40 per cent more thermal efficiency than the gasoline engine. Using a lower-priced fuel to begin with, it then delivers more miles per gallon. This means a potential saving of countless millions of dollars in world transportation and the conservation of the world's fuel reserves.

Question: *How does the diesel achieve such efficiency?*

Answer: Entire textbooks have been written on this question but to put it briefly: by operating at very high and constant compression, and by using more air in the combustion than does the gasoline engine, the diesel converts more of the heat value of the fuel into active power.

Question: *What does this higher thermal efficiency mean to me?*

Answer: About 75 per cent more miles per gallon than comparable gasoline-powered trucks . . . and this with a fuel which costs less per gallon.

Question: *What have been the problems in diesel development?*

Answer: For 23 years the aim has been to achieve controlled combustion and to secure efficient fuel injection

at the high speed at which these engines must run for today's modern performance. At the same time, another aim has been to keep the weight and size comparable to that of a gasoline engine.

These are no longer problems with Mack. Efficient combustion control has been secured, resulting in diesel engines which are smokeless and vibrationless, and which are comparable in performance, weight and size to Mack's famous Thermodyne gasoline engines.

Question: *What advantages other than low fuel cost are to be expected of diesel trucks?*

Answer: There is only one advantage in a diesel engine that we know of, and that is *fuel economy*. But that advantage is so great in a Mack that it quickly repays the added cost of building and installing a diesel.

Question: *If the added cost is soon offset by the fuel economy, isn't that enough to make the diesel obsolete the gasoline engine?*

Answer: Decidedly not. At least, not yet. You can realize on the fuel economy of a diesel *only* if you operate a sufficient number of miles or engine hours per year. And this is presuming a truck or tractor of about 40,000 lbs. or more gross weight (chassis, body and load).

Question: *But aren't there a lot of trucks in this category—heavy duty commercials, long distance freight lines, building contractors, earth movers, concrete mixers, mines and quarries, bus lines, etc.?*

Answer: Yes. If you are in one of these categories, the diesel engine today can very possibly *revolutionize your cost picture!*

Question: *In the main, then, diesel truck engine problems have been solved?*

Answer: As we have indicated above, they have not only been solved; they have been solved *brilliantly!* Today, in Mack's newly perfected line of diesel truck engines—built by Mack only for Mack trucks—industry is offered an immediate means of cutting costs and increasing profits by substantial margins.

Question: *For instance?*

Answer: The smallest Mack diesel tractor unit, 40,000 lbs. gross (weight of complete unit and load), while costing a bit more than a Mack gasoline engine truck of equivalent power, is capable of earning back this extra cost in much less than a year on its fuel savings alone! After that, its owner can pocket a newly found profit of considerable size! Of course, the actual write-off of the cost for a Mack

DIESELS ?"

diesel will take greater or less time, depending on the mileage or engine hours resulting from the individual operation. It is a Mack sales policy never to sell a man a diesel who can't profit by it—and quickly! Your needs are carefully analyzed. If you cannot readily profit by operating diesels, Mack won't sell you one! If you *can* profit by it—quickly—you will find that a Mack diesel will give your business substantial new earning power . . . as it is already doing for thousands of truck owners!

Question: *What is a typical diesel fuel cost comparison with gasoline engine operation?*

Answer: Here is an example of how a Mack diesel saves money:

You may have a truck on the road which, in the next hour, will travel 35 miles. If it gets as much as 5 miles per gallon of gasoline, your fuel cost with, let us say, 24-cent gasoline would be $1.68. If that truck were a Mack diesel, it would use scarcely 4 gallons of fuel. And even at 17¢ a gallon, the total fuel cost would be but 68¢—a saving of $1 per hour . . . *$1 saved in only 35 miles of travel!*

Question: *How about maintenance?*

Answer: Because most of the common parts are identical with Mack gasoline engine parts (which, incidentally, are available everywhere and at gas-engine parts prices) the basic Mack diesel engine can be serviced as easily as can the gasoline engine. Therefore, the over-all maintenance costs should not exceed—at least by any appreciable amount—those of any gasoline engine. The Mack diesel is simplicity itself!

Question: *How many diesel-powered Macks have already been built?*

Answer: Thousands! More than 17,000 were built for the United States and Allied Armies alone during the war. Postwar, Mack has perfected a work of 23 years to bring to American industry, for the first time, engines which give performance comparable to gasoline engines at considerably less fuel cost per mile.

Question: *Isn't it true that diesels smoke and smell worse than gasoline engines?*

Answer: Many did—and some still do. But because of Mack's controlled combustion and the exclusive Mack patented Synchrovance, which provides variable and automatic injection timing, Mack diesel engines are virtually smokeless and odorless. That is the reason why a Mack diesel needs no "smokestacks" and can run its exhaust pipes in the conventional manner —under the chassis frame.

Question: *You say the Mack diesel is simple. Isn't it the general impression that a diesel employs principles widely different from those of a gasoline engine?*

Answer: Not Mack engines. They are of the proved and practical 4-cycle type, which means that they operate on a principle similar to that of the engine in your own car and the gasoline engine in any truck.

Question: *What is the size range of Mack diesels?*

Answer: There are three—of 110, 138 and 165 horsepower, respectively. These engines are designed exclusively for Mack chassis, coupled through Mack transmissions to Mack rear ends. Thus, proper balance of design and the ultimate in performance are achieved.

In every respect—smoothness, performance, flexibility and reliability—the new Mack diesels match Mack's gasoline engines, and they do it with *revolutionary* economy!

You, as a motor truck user, owe it to yourself to go to the nearest Mack branch or dealer for a demonstration of what the new Mack diesel can do. He can analyze your trucking requirements and can tell you in tangible figures just how much you can expect to save with a Mack diesel.

Never before could you buy so *much* for your trucking dollar as you can today from Mack. There has never been a better time than the present to make the *right* investment in trucks.

More than ever before, you get more for your money in a Mack, whether it's a gasoline- or a diesel-powered unit.

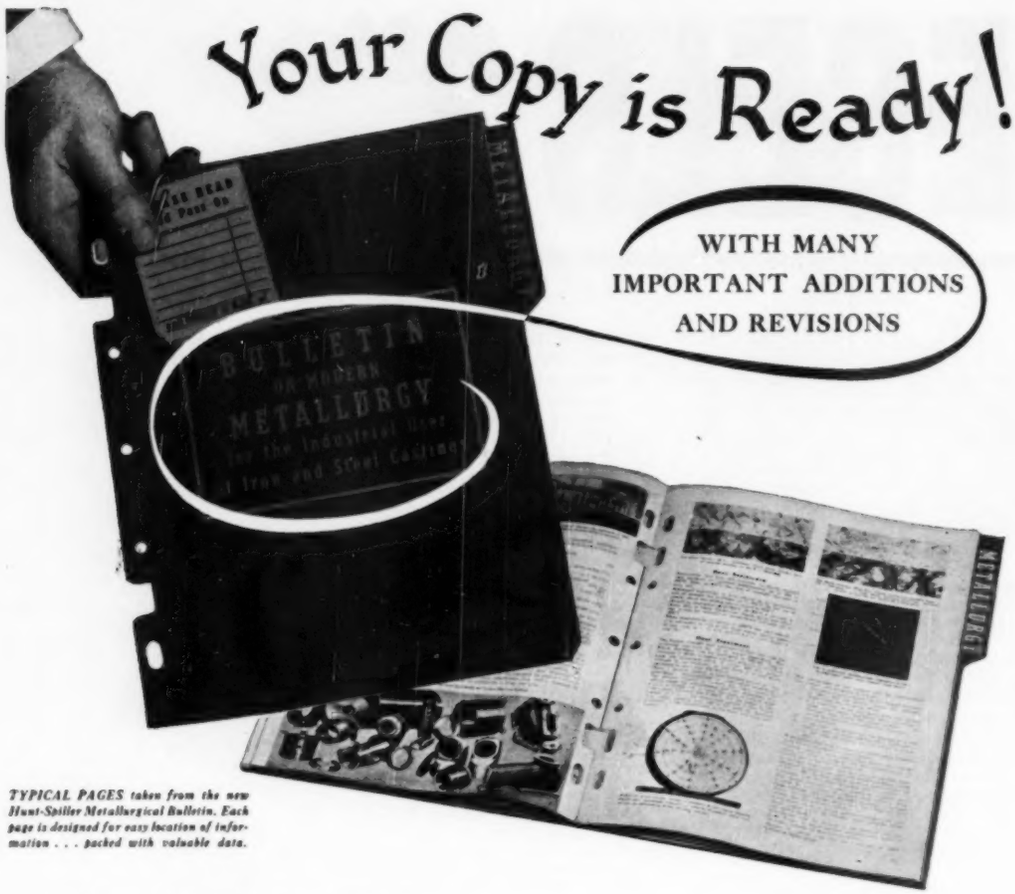
See Mack as soon as you can!

Modernize with Mack ...outlasts them all!

Mack Trucks, Inc., Empire State Bldg., New York 1, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

Your Copy is Ready!

WITH MANY IMPORTANT ADDITIONS AND REVISIONS



TYPICAL PAGES taken from the new Hunt-Spiller Metallurgical Bulletin. Each page is designed for easy location of information . . . packed with valuable data.

Just off the press! This up-to-the-minute and highly informative bulletin is a practical guide for the user of iron and steel castings. Its pages are packed with technical data on many types of metals and alloys or castings. This information has been compiled from the extensive research files of the Hunt-Spiller metallurgical laboratories, among the largest and most modern in the foundry industry. These laboratory files are the result of painstaking investigation of the properties and characteristics of metals by chemical analysis, physical testing, metallography and radiography.

Covered in detail are the properties and characteristics of Gun Iron and many of its alloys. This dense, wear-resistant iron is produced exclusively by Hunt-Spiller by the air furnace process. It has a number of superior physical properties and is widely used for industrial castings subjected to frictional wear, high heat, shock and vibration.

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NEW RPM DELO OILS
cut engine wear-rate up to 85%

New RPM DELO Lubricating Oils contain advanced, special compounding. Proved in actual operation, they keep engines cleaner, increase protection and extend overhaul periods of all heavy-duty engines.

Cut liner wear rate up to 85%. In service under extreme operation conditions, these new RPM DELO Oils reduced wear-rates up to 85% over conventional heavy-duty type lubricants.

Reduced engine deposits as much as 75%. Superior compounding in new RPM DELO Oils kept top-ring grooves, oil rings, and skirt areas of pistons remarkably clean in high-temperature, high-output truck and tractor engines.

Saved 40% to 60% on maintenance. Records show that new RPM DELO Oils cut maintenance costs as much as 60%, reduced oil consumption 30% to 50% over the long run.

Proved in full range of engine service. This new line covers normal to extremely severe conditions. The grade that meets your needs will double protection against lubrication failures, give you all-around better engine performance.

RPM DELO Heavy Duty Lubricating Oil
A new, high quality-level compounded oil recommended for heavy-duty diesel or gasoline engines in normal to difficult service. (Meets U. S. Army Specification 2-104B.)

RPM DELO Special Lubricating Oil
Companion product to RPM DELO Heavy Duty Lubricating Oil. Has higher viscosity index for special operating conditions. (Also meets U. S. Army Specification 2-104B.)

RPM DELO Supercharged—1 Lubricating Oil
An entirely new product of higher quality-level than the products above. Fortified with new, more powerful compounding. Recommended for severe and abnormal engine service. (Meets U. S. Army Specification 2-104B, Supplemental List No. 1.)

RPM DELO Supercharged—2 Lubricating Oil
Highest quality-level oil, designed for extremely severe operating conditions. (Meets U. S. Army Specification 2-104B, Supplemental List No. 2, also the rigid requirements of Caterpillar Tractor Company's Superior Lubricants—Series 2.)

Send for the full report on new RPM DELO Oils. Actual test data furnished free. For complete information and the name of your nearest Distributor, write to any of the companies listed below.

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225 Bush Street, San Francisco 20, Calif.

The California Oil Company
Barber, N.J., Chicago, New Orleans

Standard Oil Co. of Texas
El Paso, Texas

The California Company
17th and Stout Streets, Denver 1, Colo.

RPM DELO LUBRICATING OILS

New and more Efficient Compounding keeps engines cleaner, increases protection, extends overhaul period

Diesel-Electric Drive

for the HARDEST KIND of Service

No type of vessel demands more from a power plant than a submarine. Supreme dependability and instant response are required—engines and crew must be able to meet critical emergencies. That is why GM engines with Diesel-Electric Drive have been installed in more than 150 vessels of this class for the United States Government.

U. S. Navy submarine—one of many underseas craft powered by General Motors.

Leader in Diesel engineering development for 38 years

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ENGINES FROM 150 TO 2000 H. P.

General Motors Diesel-Electric Drive has powered more than 700 vessels in 22 different classifications.

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WASHINGTON, D. C.
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General Motors Corp.
504 Hill Building
Washington 6, D. C.

CAMBRIDGE, MASS.
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Cambridge 41, Mass.

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Curtis Marine Co., Inc.
548 Front Street
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JACKSONVILLE, FLA.
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332 E. Bay Street
Jacksonville 2, Fla.

TAMPA, FLA.
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ORANGE, TEXAS
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Announcing the New

GENERAL MOTORS GP-7 ROAD SWITCHER

This new 1500 h.p. Road Switcher combines the high visibility of a switcher with the power and versatility of the General Motors F7. It can be geared to cover a range of requirements up to 90-mile-an-hour passenger service. It operates in either direction with single control. A simplified electrical control system provides instant response to the throttle for ease and speed in switching. Starting tractive effort is *under the control of the operator*. Transition is fully automatic. Acceleration is velvet-smooth. Equipment is arranged for ready accessibility and for maximum interchangeability with other General Motors Diesel units.

Here is a locomotive that can switch out the yard and get out on the line to do either a freight or passenger job or both. With the new GP-7, railroads can obtain the maximum savings and increased earnings of dieselization with General Motors locomotives.

GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS • LA GRANGE, ILL.
Home of the Diesel Locomotive

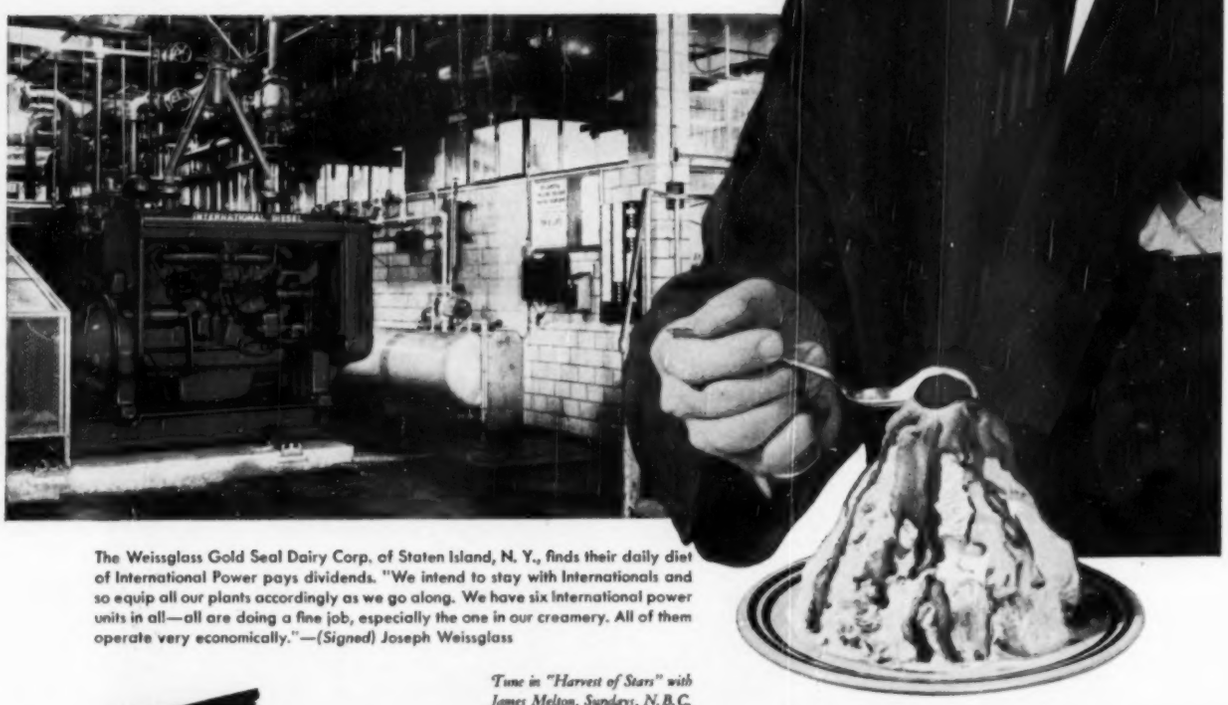
DAILY DIVIDEND

Profits are produced by low costs and low cost power is a daily dividend delivered by International Power.

That's why a metropolitan dairy and ice cream plant chose International Diesels to drive the compressors. Years of operation here have proved that dependable Internationals cost less than any other source of power.

Here's how to get a daily diet of dividends from your power. See your International Power Unit dealer —we'll tell you where to find him if you don't already know—and let him show you how the right size International Power Units will shrink your power costs.

INTERNATIONAL HARVESTER COMPANY • Chicago



The Weissglass Gold Seal Dairy Corp. of Staten Island, N. Y., finds their daily diet of International Power pays dividends. "We intend to stay with Internationals and so equip all our plants accordingly as we go along. We have six International power units in all—all are doing a fine job, especially the one in our creamery. All of them operate very economically."—*(Signed)* Joseph Weissglass

Tune in "Harvest of Stars" with James Melton, Sundays, N.B.C.

Standardize on Power that Pays

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WHEEL TRACTORS
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POWER UNITS

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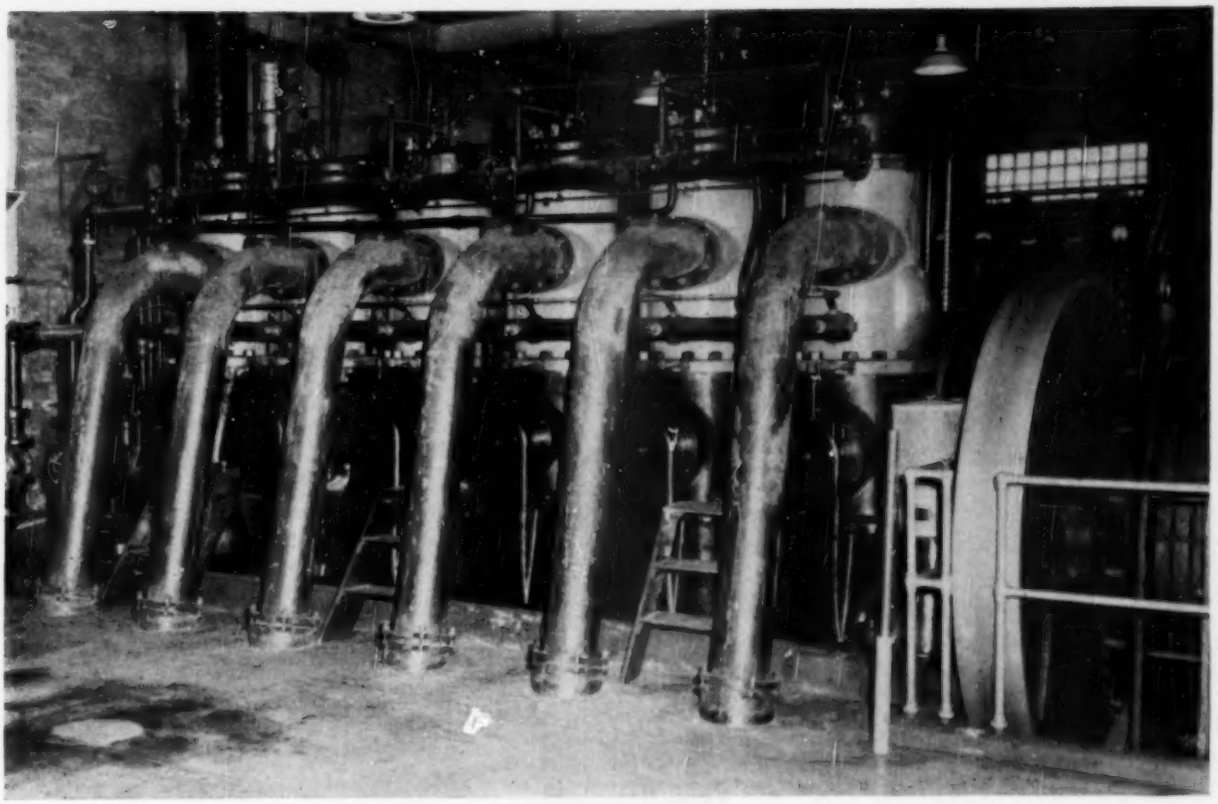


Isn't this saving in lubricant worth getting?

YOUR Diesel engines need not have lubrication troubles in order to benefit by a switch to STANDARD HD Oil. This is shown by the experience of a midwest municipal power plant with the 360-HP FM Diesel shown above.

Maintenance costs for the engine were moderate. Efficiency was satisfactory. Nevertheless, the plant operators were continually on the lookout for ways to imp ove operation. That point of view led to a trial of STANDARD HD Oil . . . with this surprising result:

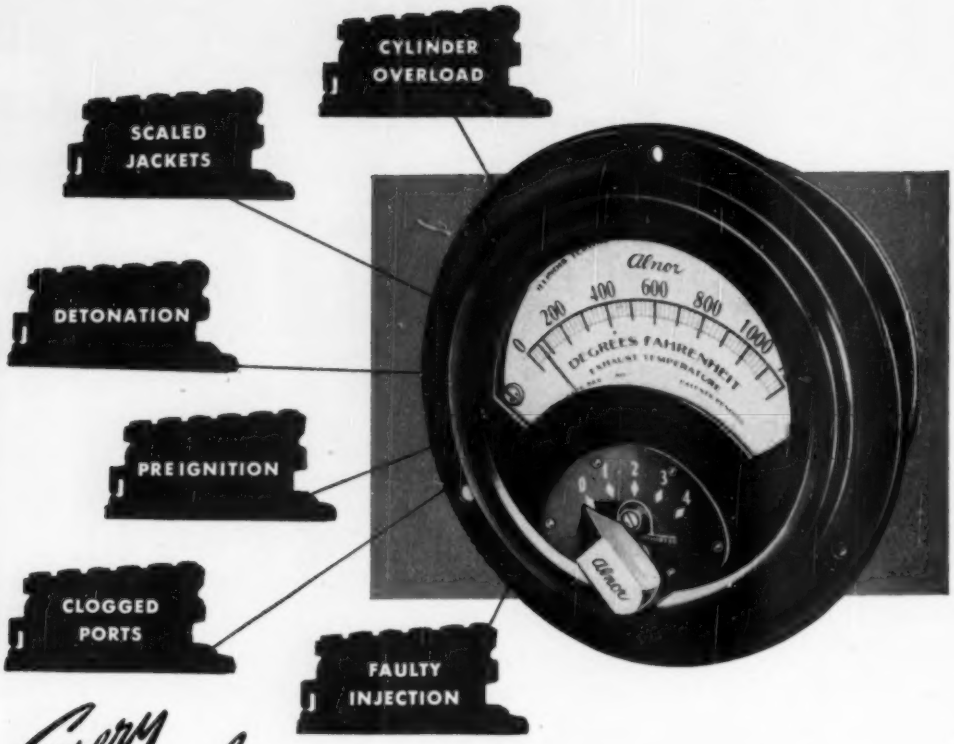
The engine had previously produced an average of 1500 kw-hr per gallon of lubricant. With the switch to STANDARD HD, that figure was boosted to 2500 kw-hr—an increase of 1000 kw-hr—a worthwhile reduction in lubricant consumption!

On the basis of such savings alone, wouldn't it be worth your while to try STANDARD HD Oil? Actually, you can profit other ways with this superior heavy-duty lubricant. For many other Diesel operators, STANDARD HD has meant less wear and cleaner engines. These benefits testify to greater savings for you. A trial will prove them. Ask for the services of a Standard Oil Lubrication Engineer.

STANDARD HD OIL

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD



Every Diesel deserves **Alnor protection**

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For complete information on the line of Alnor exhaust pyrometers available to you, send for bulletin 4361 which contains the whole story.

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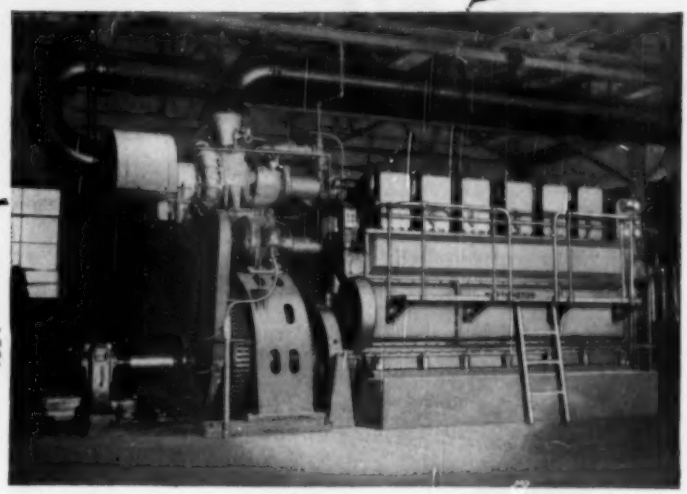
PRECISION INSTRUMENTS
FOR EVERY INDUSTRY

Easier to keep going when the going's tough!



A Worthington SDH Supercharged 865 hp Diesel Engine in Barton Mines' new plant. A similar unit will be installed soon.

Worthington Diesels Simplify Maintenance Under Excessive Dust Conditions

Barton Mines of North Creek, N.Y., is the largest producer in the U.S. of abrasive garnet. In its older power plant the company had 5 Diesels, one of them a Worthington Type BB, which recently has been moved to a newly built plant already housing a new Worthington Type SDH Supercharged Diesel.

Concerning the easy accessibility and other advantages of Barton's Worthington equipment, here's striking testimony from Chief Engineer E. F. Andrus:

"Because of the need for repair and replacement due to our dust conditions, we have to have equipment that's easy to get at. In our Worthington engine we can get at any main bearing in 15 minutes, whereas that takes 24 hours in another Diesel . . . Other major factors being prompt delivery of spare parts, and access to technical advice, we prefer Worthington for its excellent service."

Operating in air laden with abrasive dust — a severe test for any engine — Worthington Diesels once again prove their cost-cutting ability. Because of its extreme accessibility, maintenance men naturally tend to service a Worthington at the first faint indication of trouble — and therefore to keep it constantly in better condition, with minimum downtime.

Besides this ease of protective maintenance, Worthington Diesels do more work on less fuel and lubricant . . . provide extra-long, trouble-free service. For further proof that *there's more worth in Worthington*, write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

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Diesel engines, 150 to 2,640 hp . . . gas engines, 175 to 1,720 hp . . . dual fuel engines, 225 to 2,640 hp.

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Balanced Angle Compressors

Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

These Vital Parts fit *ALL* GM "71" DIESELS

Every GM Series 71 Diesel engine, whether a two-cylinder or one of a Quad 6, *has the same bore and stroke.* This means that practically all moving parts are exactly the same for any size Series 71 engine from 43 to 520 continuous B.H.P.

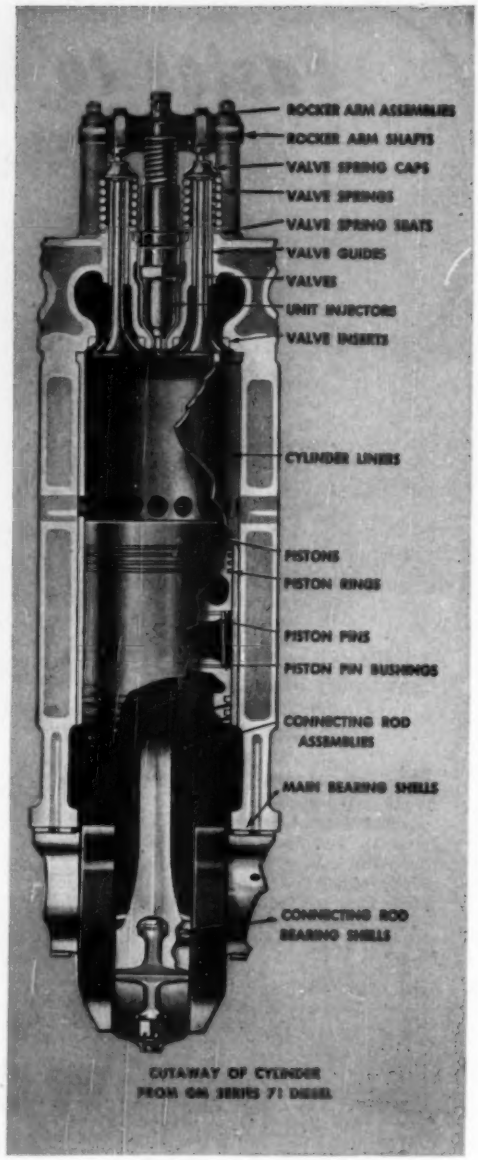
For example, all of the GM Diesel parts shown here, plus dozens more, are completely interchangeable, regardless of the number of cylinders, horsepower, age or usage of the engine.

To large contractors, oil drillers, truck or boat fleet operators, this unique feature of GM Diesel design means lower parts inventories and less time out for maintenance.

To the individual owner, it brings a no less important benefit. A *single* inventory of basic parts on the distributor's shelves increases the availability to owners of the *right* part when it is needed.

Maximum parts interchangeability is just one of the many *plus* values that go with your purchase of General Motors Diesel engines—a good reason why it pays to *standardize* on GM Series 71 Diesels.

For topmost satisfaction and reliability, always buy genuine "Factory-Engineered" GM Diesel parts from your authorized distributor or dealer.



CUTAWAY OF CYLINDER FROM GM SERIES 71 DIESEL

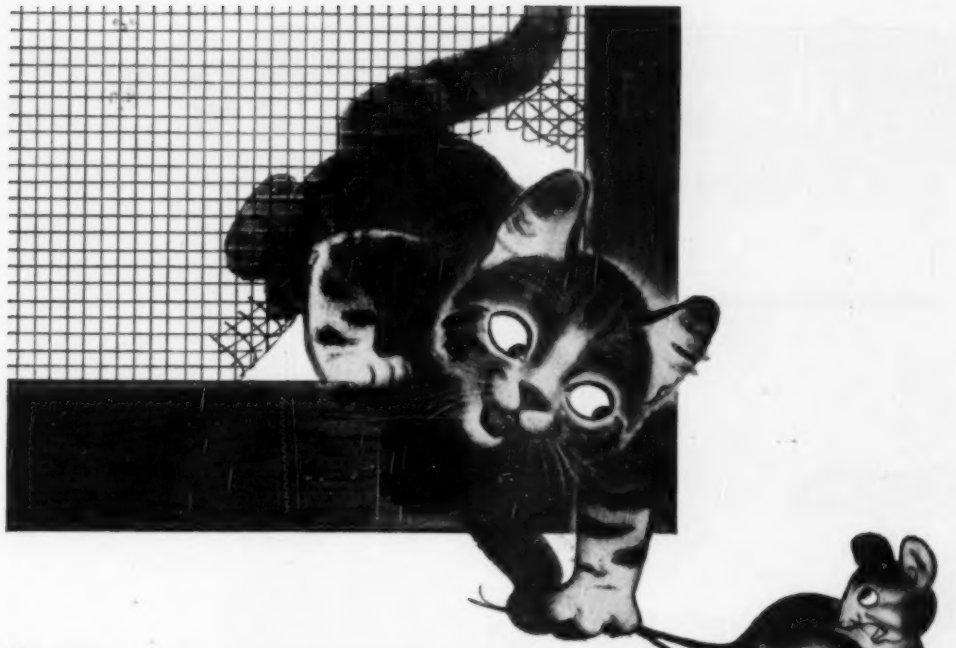
DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES...Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS...Up to 800 H.P.

GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

GM GENERAL MOTORS DIESEL POWER



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Peak production . . . without worry of breakdown due to friction and wear . . . is made easier with Tycol high quality greases.

Made to "absorb punishment" without thinning down and dripping, Tycol greases avoid wasted lubricant, lost bearings and unnecessary down-time. These ultra-safe lubricants keep bearings . . . gears . . . shafts . . . friction-free and cool. They are available in grades with the proper "*PENETRATION" needed to give power a chance to produce with a minimum of waste.

Call your nearest Tide Water Associated office. Let them suggest the Tycol grease best suited to your needs . . . and remember, Tycol green cast greases are made from high quality cylinder stock and well refined neutral oil, with a minimum of soap — a maximum of oil . . . more efficient lubrication per pound of grease.

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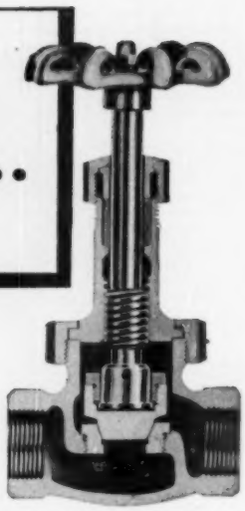
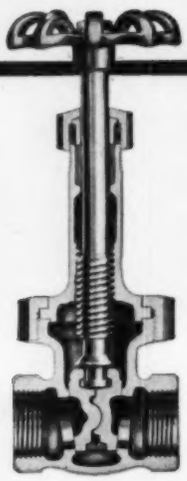
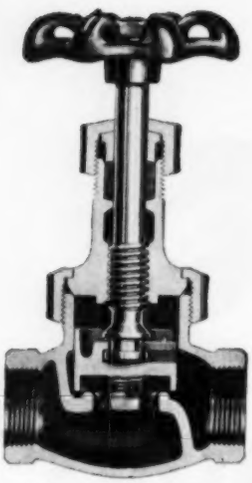
Walworth bronze valves...



Walworth No. 225P Globe Valve
500 Brinell Seat and Disc



Walworth
No. 29 Gate Valve



Walworth No. 95 Globe Valve
Re-New-Disc

built to give dependable trouble-free service on all recommended jobs

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Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including ¾-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

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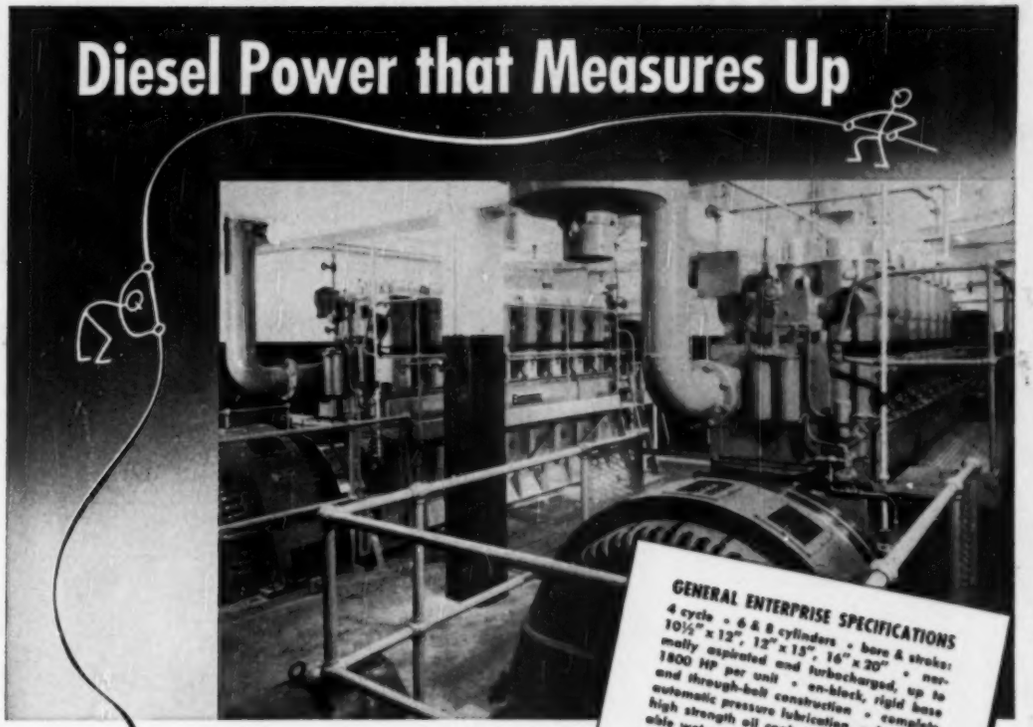

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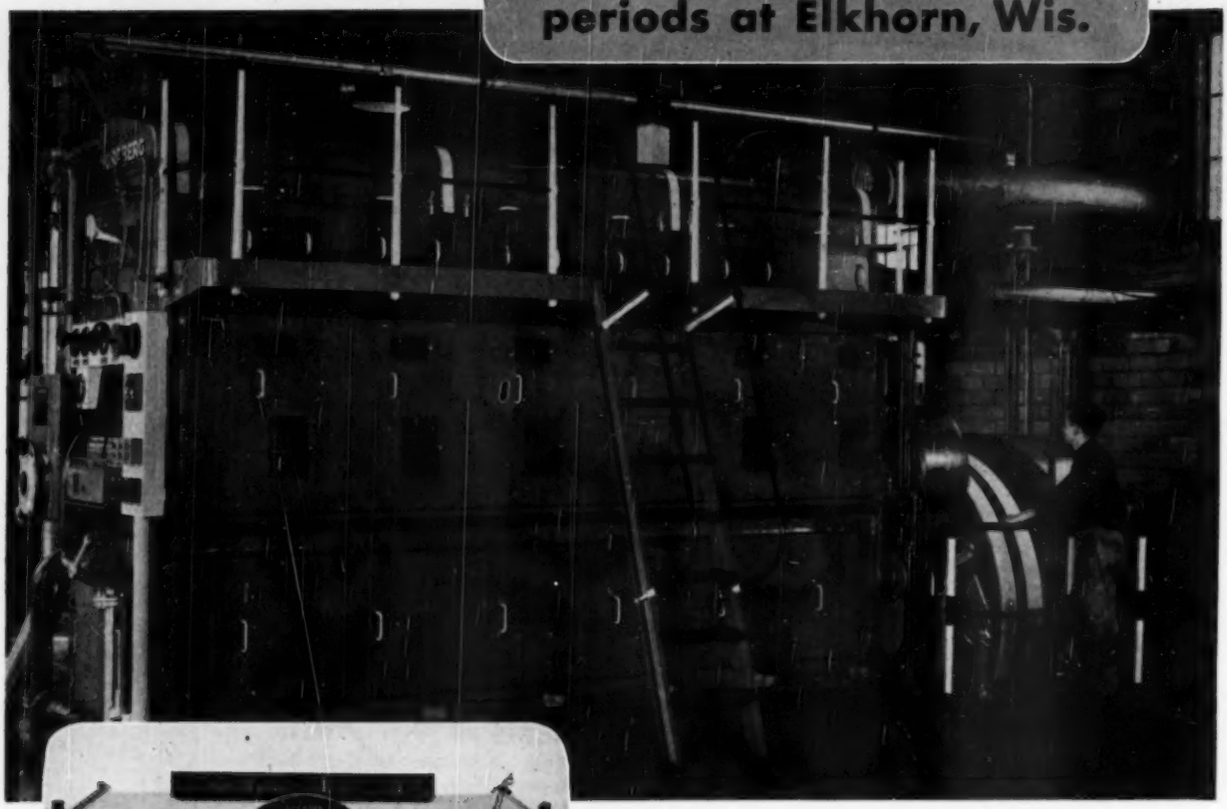
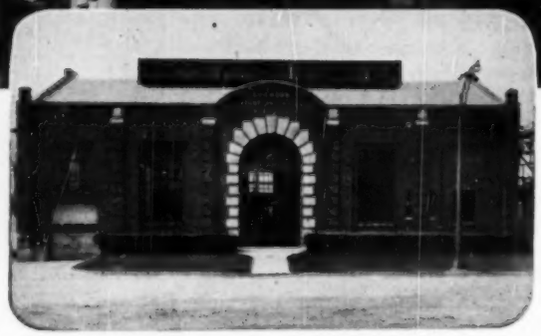
NORDBERG GAS BURNING DIESEL

levels out peak demand periods at Elkhorn, Wis.





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P130

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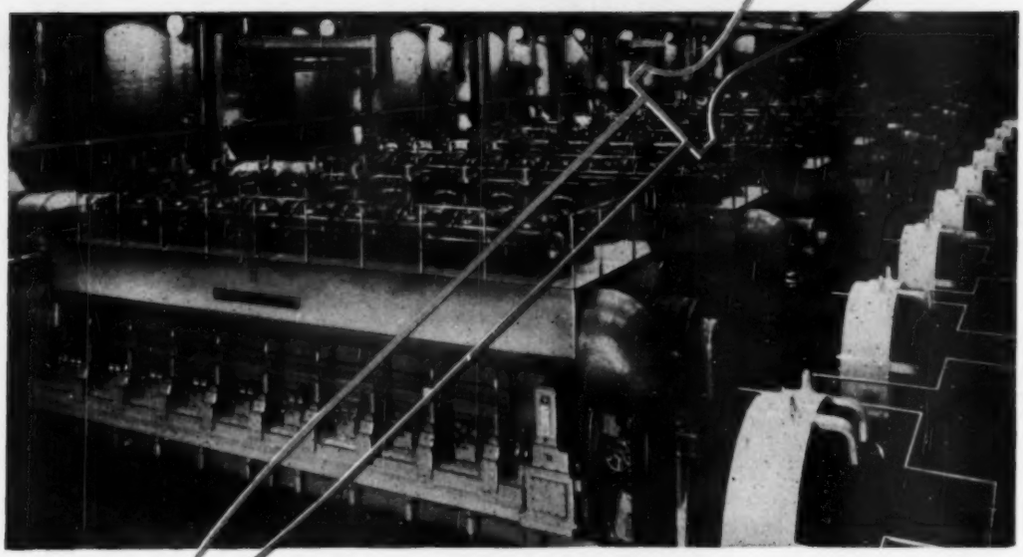

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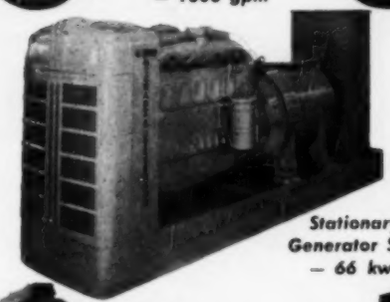

Stationary Generator Set — 66 kw

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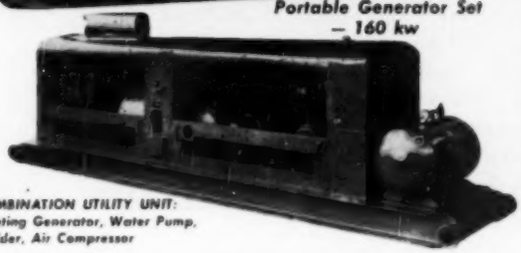

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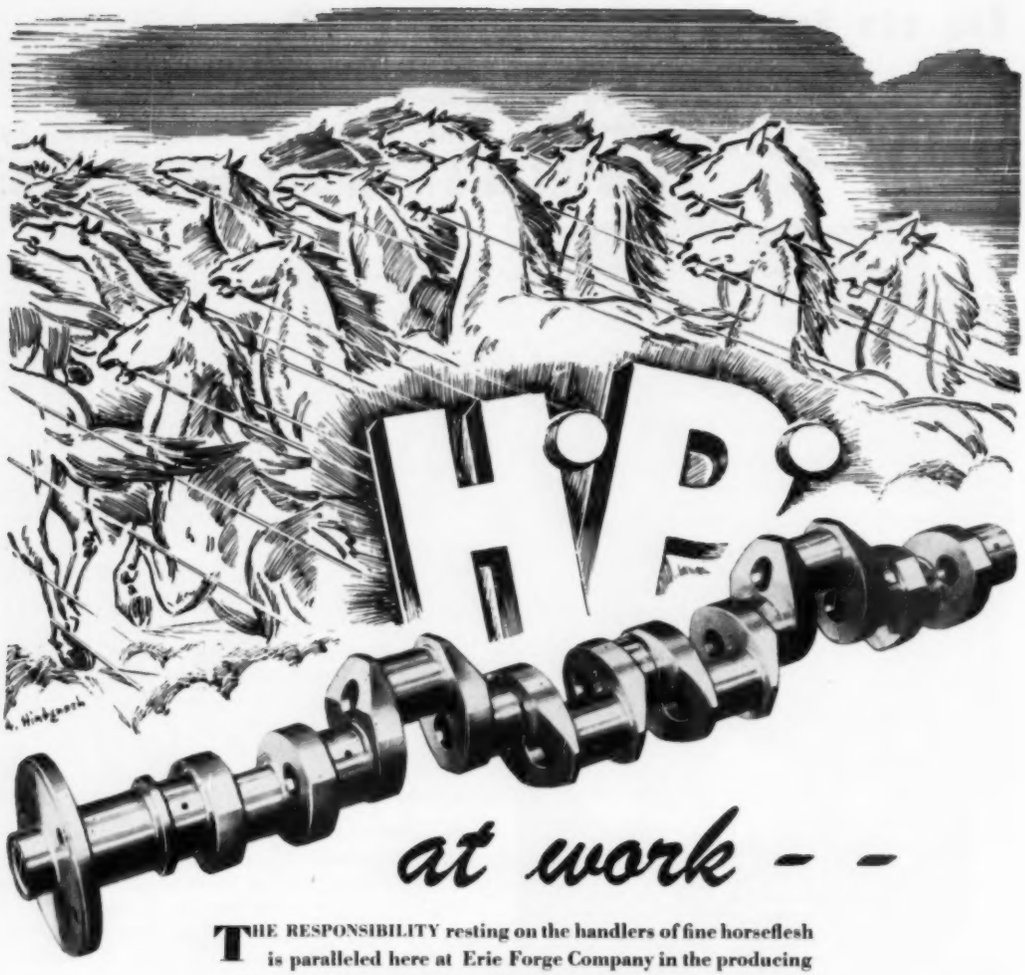

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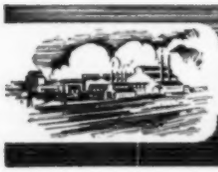

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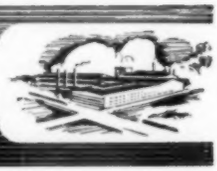

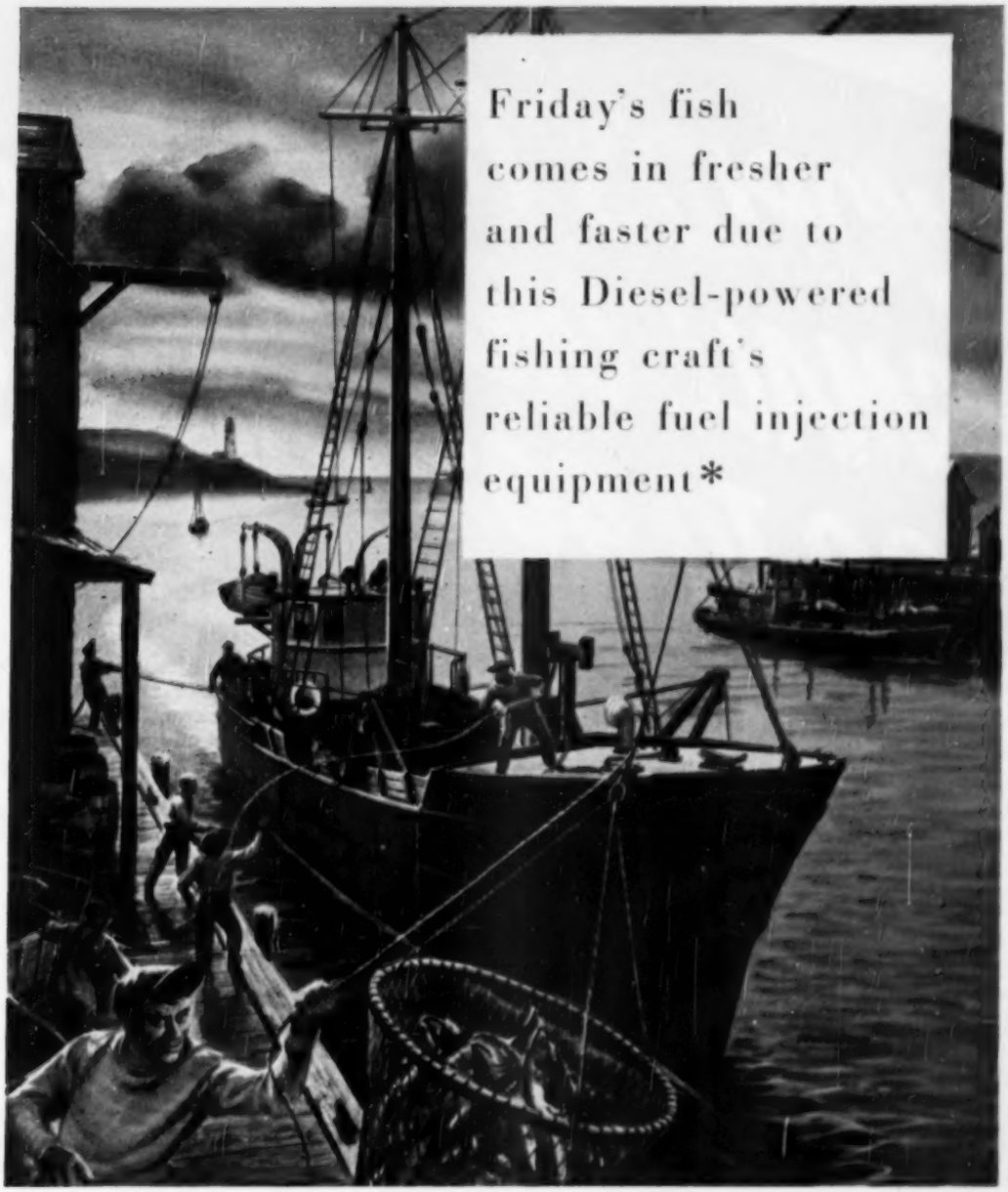

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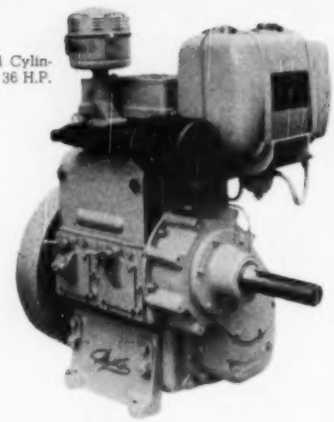
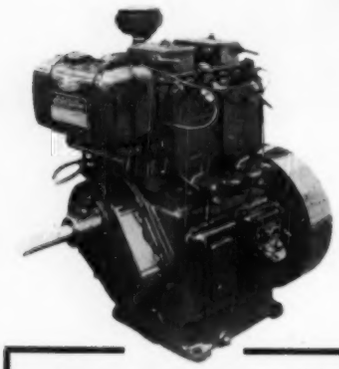


MODEL AV: 1 and 2 Cylinders, giving 5 and 10 H.P. at 1500 R.P.M.



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CONTENTS FOR JANUARY, 1950

Diesels Demand "Degree" Dealers 25
The Marvelous Morans 28
Dustless Diesel Farming 31
A "Rolling Lab" on the High Rails 32
M.S. Topeka 34
Diesel Tug in Venezuela 35
Gas Turbine Natural Gas Pumping Unit 36
Consolidated Freightways 38
Diesels Spearhead Soil Conservation Campaign 40
Two Converted Diesel Vessels 42
Fifteen Years of Diesel Satisfaction 44
M.S. Jytte Skou 46
Yolande Bertin Completed 48
More Diesel Buses for Boston & Maine 49
Diesel Work Boats for Arabia 50
Farming A Lake 51
Engines of Mercy 52
Diesel Industry Gets Top Sales Rating 54
High Speed Diesels—Design, Operation and Maintenance 56
Exchange Your Diesel Maintenance Ideas 58
Supervising and Operating Engineers Section 61

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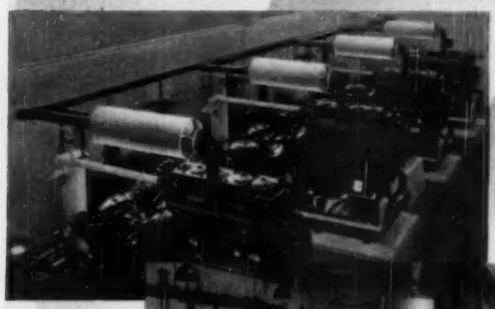
FRONT COVER ILLUSTRATION

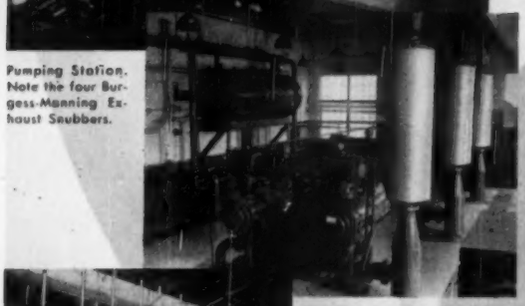
The *Charlotte*, designed and built by Ira S. Bushey & Sons in 1939, powered with an 805-hp. Fairbanks Morse. Went into service during the war, came out in good shape and now operates for the Red Star Towing Co.

INDUSTRIAL

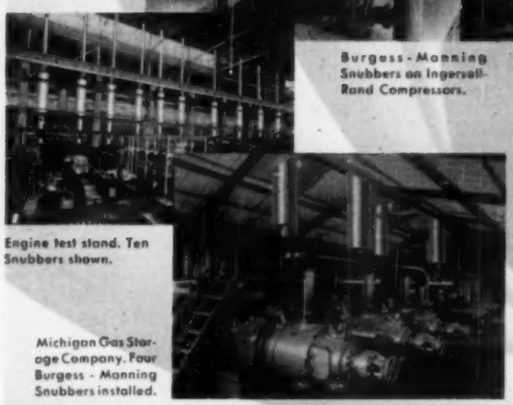
Factories, Test Stands, Hotels



Pumping Station. Note the four Burgess-Manning Exhaust Snubbers.



Burgess-Manning Snubbers on Ingersoll-Rand Compressors.



Engine test stand. Ten Snubbers shown.

Michigan Gas Storage Company. Four Burgess - Manning Snubbers installed.

UTILITIES

Power Plants, Gas Storage

Electric Power Plant using Burgess-Manning Snubbers.

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Burgess-Manning Snubber on 8-cylinder pipe line gathering engine.

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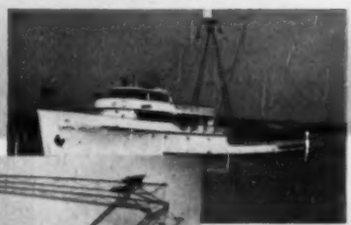


Tuna purse seiner, "Santa Helena," uses Burgess-Manning Snubbers.

Portable drilling rig equipped with a Burgess - Manning Spark Arrester-Snubber.

Diesel locomotive employs Burgess-Manning Snubbers.

Generator end of Diesel. Note Burgess - Manning Snubbers in foreground.

A QUIET SPOT FOR TELEPHONING

Burgess - Manning Acousti-Booth.

DIESELS DEMAND "DEGREE" DEALERS

By F. HAL HIGGINS

California Farm Equipment Industry Selects Shirt-Sleeve State College and Works Out 4-Year Course to Train Young Men for Careers to Merchandise to Top Farmers

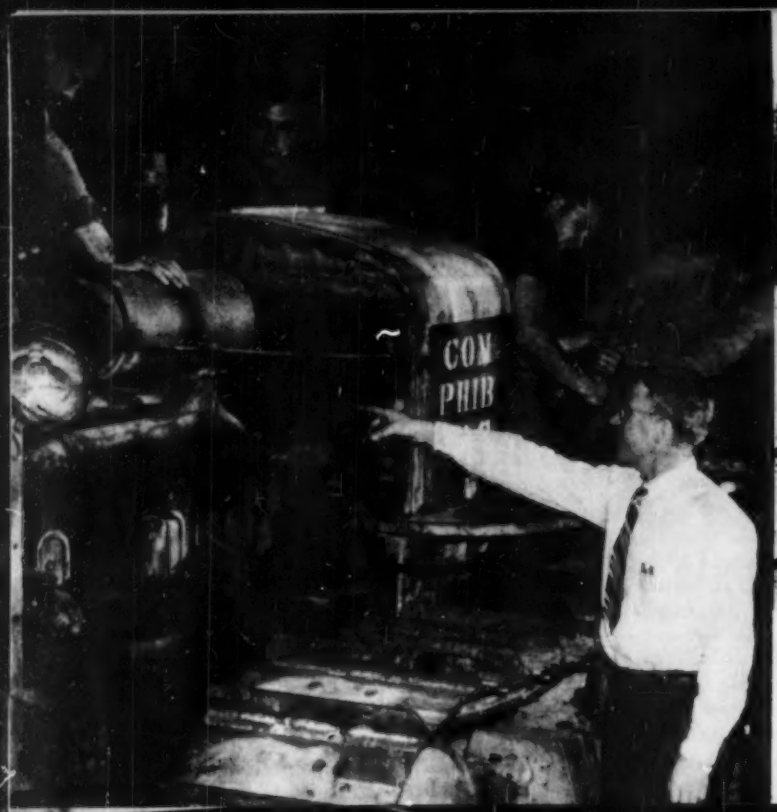
WAR is over and the post-war farm equipment merchandising must have better educated dealers to sell and service the diesel-powered goods an educated farmer and his skilled operators are demanding to cut their operating costs to stay in business. So decided the California Farm Equipment Dealers Association three years ago when the Salinas dealers in International, Allis-Chalmers, Caterpillar and Oliver tractors with full lines of farm, contracting and logging equipment sparked the organization of the "CFEDA." By the time they had organized the dealers of the state in territorial groups and held their first state convention at historic old Monterey they were unanimous in the diesel ranks that one outstanding need was for better educated men in their personnel to meet the public that was buying and using their wares. No longer was it sufficient to pick up any strong backed farm boy who yearned to get away from the manure fork or the ex-mechanic from the garage around the corner just to fill out the shop to meet war demands for "service" to keep the tractors rolling. In fact, one veteran farm tractor man emphasized that "We never want to allow our farm equipment business to sink to the depths of the auto industry service."

An education committee was appointed with F. W. Tarr as chairman. Tarr is the Caterpillar-Deere dealer at Chico, with branches at Redding, Red Bluff and Gridley for a territory covering ranch, logging, mining, public utility, contracting and Government use of diesel engines, tractors and road building machines on a large scale. On this education committee were Charles Mathers, manager of the famous Farmer's Mercantile Co., International dealer at Salinas, Hollister and Watsonville, in one of the most efficient agricultural areas in the world. Also, Phillip Livingston, of E. C. Livingston Equipment Co., Paso Robles, King City and Salinas, with the Allis-Chalmers full line plus G. M. diesel engines, Minneapolis-Moline farm implements and Harris combines in a long strip of territory covering dry and irrigated farming, contracting, logging and oil field development. Elwood Johnson, Arthur C. Day Implement Co., Hayward, another IH dealership; Lee Jones, Peerless Tractor & Equipment Co., another Allis-Chalmers dealer at Fresno; plus Editor Osgood Murdock, of the *Implement Record* of San Francisco; and George Whisler, Salinas *Californian* farm editor, completed the committee.

First fruits of this Education Committee's long-range planning for lifting itself to higher merchandising levels came on August 5, last, when 16 young men from dealerships at Fresno, Salinas, Visalia, Hollister, Lemoore, Dos Palos, Merced, Paso Robles, San Diego and San Luis Obispo walked up to President McPhee of the California State Polytechnic College at San Luis Obispo and received diplomas for their 2-weeks short course. It was an auspicious occasion with officials of the state dealers' association, editors, educators and others present. It was the testing of the idea for a full 4-year course at this same institution and it tested OK.

Explained Secretary-Manager S. H. Strathman, of the dealers' association. "We initiated this program a year ago. First we reviewed the available courses at California State Polytechnic College to see just what they had that would fit into a well-rounded course. We found that their type of instruction was correct for our purposes. Furthermore, that they had numerous courses pertaining

General view of "Cal-Poly" at San Luis Obispo, California.



Class doing lab work. James F. Merson, Head of Agricultural Engineering and Mechanical Department, is seen giving instructions.

Ernest Grasty, of Crozet, Virginia, operating an Allis-Chalmers tractor.

Machine shop at California State Polytechnical College at San Luis Obispo, Calif.

Math class—Dr. Milo Whitson, instructor.

to agriculture, agricultural machinery, shop and similar courses which could be included in a desired curriculum either as was or with some changes. We did, however, find that four major areas of desired instruction were not available. (1) shop management and operation; (2) inventory systems, controls and operation; (3) finances and credit; and (4) due to their CNPA course they have something on merchandising but not enough and not specific for our business.

"We then set up four committees to make outlines for these four areas. These outlines to show what we wanted or needed as instruction courses in those fields. These committees individually and as a committee of the whole did an excellent job. When the four reports were finally completed, they were submitted to the college. The college set up four parallel committees who went over these outlines and made separate reports on each of them. The two groups of committees then got together and went over the whole picture. We are now in the process, or at least the school is, in setting the entire course up for instruction purposes.

"The full course will be offered beginning with the fall quarter last September. A full four-years' course will be offered for those who desire it. It will be possible to take less than four years. A degree can be obtained, and possibly a two-year certificate course. In addition to that course, a refresher course will be offered during the summer quarter. These courses will be available to advanced students and to those presently engaged or employed in the industry. The first of these courses will be available this summer. A special two-weeks course on merchandising will be available to those now in the industry. This short course first ran from July 25th to August 6th, last.

"This course is of particular interest to the industry because it is the first of its kind in the United States. Michigan State has had a short course for three years now, but it has only included instruction in the shop end of the business and it consisted of one quarter academic work, then one quarter of on-the-job training, then another quarter of academic work and a fourth quarter of on-the-job training. They were planning to add one more quarter of academic work this year, but at best it offered three quarters of a year of academic training practically all in shop work with the exception of the third quarter, which included some merchandising, management and business and accounting practices. The new fifth quarter to deal with some soil conservation, farm structures and some English. Two or three other colleges have been considering establishing short courses similar to Michigan State but none of them even considered, at least at this time, offering the completed course which is being set up at Cal Poly."

The "Cal-Poly," as it is familiarly known by its agricultural students, is a branch of the University of California Agricultural College at Davis, several of the faculty from that famous college starting up the new school for more practical instruction for farm boys some 20-odd years ago to meet a demand from young fellows who did not have the time to devote four full years to all the theory in agronomy, horticulture, soils, animal husbandry, etc. Some years later it was made one of the State colleges, and with increased population with war and post-war increased enrollment in all schools in California, it has grown to big proportions. Always it has attempted to interpret the demands of its prospects and add and adapt courses to the needs. Hence, when an industry the size of the California farm equipment dealers came to the college faculty it got immediate and hearty cooperation as faculty and dealer education committees carefully worked out a full four-year course to graduate young men for careers in the farm equipment industry—"Dealers, Service, Engineering, Distributors' Representatives, Manufacturers' Staffs, Sales, Parts, Office," says the new announcements sent out in a joint sponsorship by California Farm Equipment Dealers Association and California State Polytechnical College.

Chairman Tarr was the guest speaker at the October 7 dinner meeting of the California Tractor & Implement Club in Berkeley. Tarr sketched the development of the idea for higher merchandising standards via higher education and appealed for manufacturer cooperation to help put it over. There are now 140 young men starting the 4-year engineering and agricultural engineering courses at Cal-Poly. They will be making their decisions soon as to whether they are going to take the full 4-year course aimed at careers in the farm equipment industry, he said. Said the jointly sponsored "Invitation to Young Men," announcing the new course:

"Businessmen in the farm equipment trade are actively sponsoring this program to attract and train young men in the production, repair, service, use, and distribution of farm machinery and equipment.

"There is at present a severe shortage of trained manpower, with every prospect of expanding opportunity in the distribution and application of farm equipment to mechanized agriculture, especially in the Far West. Within the past two decades many young men in this trade have advanced rapidly both in status and in income.

"California State Polytechnic College at San Luis Obispo offers excellent opportunities for training in this field. The college is administered directly by the State Board of Education and the State Department of Education. Its campus includes more than 3,500 acres. Students may enroll for four-year degree courses, three-year technical courses, two-year vocational courses, or for special instruction.

"Admission is based on demonstrated and continuing ability and interest, and is open to graduates of standard high schools, men over 21 years of age, veterans of World War II, and others who demonstrate interest and aptitude.

"The California Farm Equipment Dealers' Association has worked with the faculty in arranging special courses designed to train students for placement in the various phases of the farm equipment trade and industry. In-service training, practical field methods, vacation employment and post-graduate placement are part of the program.

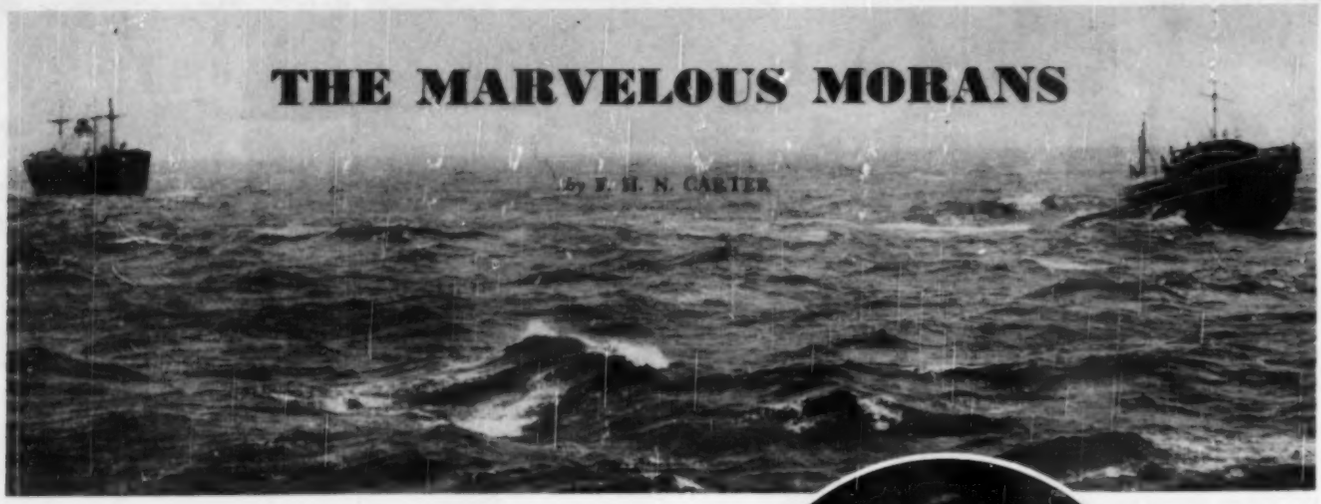
"Regular Courses—These courses from the college's regular curricula tie in with the farm equipment industry applied training program: Agricultural Mechanics, Farm Power, Irrigation, Arc and Acetylene Welding, Engineering Drafting, Public Speaking, Letter Writing, General Accounting, Farm Management, Commercial Law, Mathematics, Advertising and Layout, English, Machine Shop, Farm Machinery, Shop Procedure and Management, Farm Tractors, Rural Electrification, Soils and Soil Conservation, Courses in Truck, Field and Fruit Crop Production, Advanced Agricultural Engineering, Report Writing, Applied Psychology.

"Special Courses—These special courses applied to trade requirements and based on dealers' recommendations are offered as electives: Financing and Credit, Parts and Inventory Control, Business Mathematics, Shop Organization.

"All these courses include practical instruction in field operation and adjustment of farm machinery and tractors, shop service and repair, shop files and records, flat rate estimating, shop arrangement and maintenance, and numerous other aspects of the farm equipment trade."

THE MARVELOUS MORANS

By E. H. N. CARTER



The tug *Marion Moran* towing French steamer *Caen* through heavy seas last October. This picture gives some idea of the severe beating the sturdy vessel took during the rescue operations. *(Photograph through the courtesy of Lt.-Cmdr. W. K. Thompson, U.S.C.G.)*

Rear Admiral Edmond J. Moran, USNR, President of the Moran Towing & Transportation Company, at work during World War II.

Five diesel-electric tugs berth *Queen Mary* instead of the previous requirements of ten steam propelled tugs.

ONE stormy day last October, the French steamer, *Caen*, lurching heavily through the enormous Atlantic swells about 150 miles ESE of the Ambrose lightship, struck some submerged object, heavily damaged her propeller and became immediately helpless at the mercy of the waves. A frantic S.O.S. brought the U. S. Coast Guard Cutter *Campbell* to the rescue. After great difficulties, a towing hawser was secured between the two vessels, but it broke almost immediately. Three more attempts were made to get another line aboard the *Caen*, but all of them were unsuccessful.

Meanwhile, to the east, a sturdy little vessel was ploughing through and sometimes, seemingly under, the tremendous seas, heading towards the two other ships. It was the New York diesel-electric tug, *Marion Moran*, one of the famous Moran fleet under the command of Captain Rodney Jones. Specially equipped for ocean towing and with a veteran crew on board, she was coming to the rescue as fast as her powerful engine could be operated without endangering her in the heavy weather. The conditions were so bad that at 70 miles from the *Caen* and again at 50 miles, the skipper had to "heave-to." The wind speed was estimated at anything between 50 and 60 mph, which is near hurricane force.

Arriving on the scene, an unexpected difficulty complicated matters—nobody on *Marion Moran* could speak French and there was no member of the *Caen's* crew who could speak or understand English. Fortunately the Coast Guard Cutter had a linguist on board and a unique three ship relay was set up to enable instructions to be passed from the tug to the disabled steamer.

At about 9 o'clock in the morning a hawser was secured between them and the tow was started towards New York. With a speed of about 4½ knots owing to the terrible conditions which were still prevailing, and in spite of destination instructions from the *Caen's* owners which were changed twice by radio, the job was completed by arriving at anchorage in Chester at about 10:30 the following night. This tow was accomplished in spite of the adverse conditions through 180 miles of heavy seas plus approximately another 75 miles of up-river towing.

This is only one example of the tremendous tasks accomplished by the Moran fleet in addition to the multitude of regular and routine berthing and towing operations carried out in and around New York harbor. It was not only a tribute to the superb seamanship of captain and crew but one more proof positive of the efficiency and reliability of diesel-electric drive.

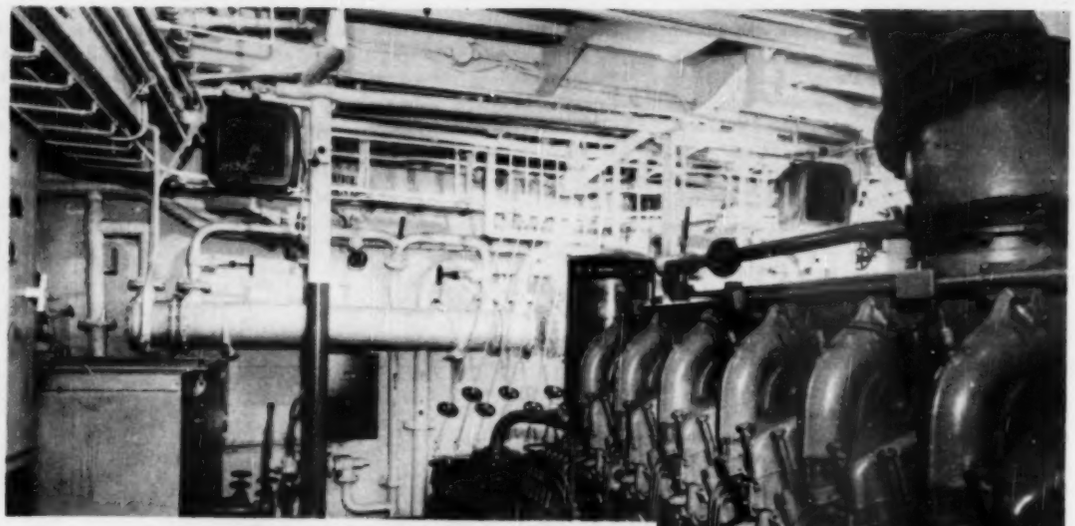
The full story of rescues accomplished and difficult tasks carried out cannot be given here. Suffice it to say that their number is legion from rescues at sea to towing floats to Europe for "D" day operations and the hauling of an enormous drydock 1,700 miles from New York to Mobile!

The guiding spirit of this adventurous yet hard-headed business concern, the Moran Towing and Transportation Company, is Rear Admiral Edmond J. Moran, USNR, whose iron hand in a velvet glove carries on the traditions and affairs of the Moran dynasty started by Michael Moran, an Erie canal bricklayer and mule driver who entered the picturesque and adventurous business of New York harbor towing about 1860 with one boat.

A humorous genius, he soon worked his way to the top of the heap and began acquiring more boats, christening each new tug with the name of one of his family, which tradition has been maintained throughout the long and colorful history of the company.

***M. Moran* en route in New York Harbor.**

Engine room view on one of the Moran tugs showing the 16-cylinder, 2-cycle, Cleveland Diesel Engine Division of General Motors Corporation, diesel engine and Allis Chalmers main generator.



Captain Jo Miller, chief dispatcher, and Lillian Harrison keep tabs on the Moran fleet in the operations room.

Organized with a precision that would be the envy of many a Navy operation, the Moran operations are carried on with the appurtenances of a major campaign. Radar, a comprehensive radio network, an up-to-the-second operations map, all play their part in the complex handling of Moran's harbor and sea-going bulldogs.

Now comprised of some forty tugs, the fleet of necessity was first equipped with steam propulsion machinery but, in modern times, to quote Admiral Moran, " . . . we became interested in diesel power because it was clear to us that there was an economy and efficiency in obtaining horsepower which could not otherwise be had."

Nowadays the bulk of the bustling fleet with the large white M on every stack is equipped with diesel-electric drives for propulsion and towing, and the steam driven boats are rapidly being either replaced by modern vessels or re-engined with diesels. Today there are twice as many diesel-electric tugs as steam driven and with the advent of *Grace Moran*, first of a new class of five tugs, the four others of which are to be named *Carol*, *Barbara*, *Doris* and *Moira*, by far the greater part of the Moran operations is handled by diesel horsepower and eventually, the whole fleet will depend on the reliable and efficient diesel engine.

As typical of the larger of these tugs, the main specifications of the *Grace Moran* class are given on these pages.

A more convincing proof of the reliability and efficiency of diesels would be hard to find. In difficult docking operations where delicate and difficult maneuvering is a requisite, the diesel-electric propelled tub in the hands of skilled seamen has long since proved its worth. In handling such giants as the Cunard White Star *Queens* great flexibility and finger tip control is a *must;* enormous damage can be done in a few moments. Handling and berthing tankers with vast quantities of highly inflammable cargo board requires not only the essential "know-how" but skill must have reliable horsepower at its disposal when the possibility of catastrophe is ever-present.

Last but not least, when lives are in danger and rescue operations are being coolly and calmly carried out, the tug's deep-water skipper must have no apprehension of engine failure to haunt him.

The maritime world respects and likes that band of pioneers, veteran seamen, skilled engineers and modern businessmen, the Moran Towing and Transportation Company.

All of the diesel-electric tugs sailing under the Moran houseflag are equipped by the Cleveland Diesel Engine Division of General Motors.

DESCRIPTION OF GRACE MORAN CLASS
Diesel-Electric Harbor Tug

Dimensions

Length Over Guards	106 feet
Length on Deck, ex Guards	105 feet
Length Between Perpendiculars	100 feet, 3 ins.
Beam, Molded	27 feet
Depth, Molded at Midship	14 feet, 9 inches
Draft, Forward	9 feet
Draft, Aft	13 feet

Other Information

Gross Tonnage	238.28
Net Tonnage	15.
Lubricating Oil	385.90 gals.
Fuel, Diesel	33,948 gals.
Potable Water	1,268 gals.
Forepeak Water	634 gals.
Steering Gear	Electric, Chain, Wildcat Type
Engine:	
Make	General Motors Model 16-278A
Type	Diesel, Two-cycle
Horsepower	1750
Number of Cylinders	16
Bore and Stroke	8¾ x10½ inches
R.P.M.	750
Main Generator:	
Make	Allis Chalmers, D.C.
Volts	525
Kilowatts	1210
R.P.M.	750
Propulsion Motor:	
Make	Westinghouse, D.C.
Volts	525
Horsepower	1500
R.P.M.	600-750

DUSTLESS DIESEL FARMING

By F. HAL HIGGINS

Idaho Farmer Beat Perpetual Dirt Cloud with Wheels instead of Tracks under His Tractors for Wheat, Potatoes, Alfalfa and Peas

Sherman Hess Idaho farmer on one of his two Hercules diesel-powered crawler tractors on which he put wheels with big tires.

THE accepted, or orthodox, machine is never accepted as perfect by the real western farmer, logger, freighter or dirt mover. He is still a frontiersman and demands something a little bigger, more rugged and better for his work than what is accepted by the rest of the world. Even modern tractors have their re-designers out on the Idaho farm front as proved by Sherman Hess and his diesel farm tractors that he changed over from crawlers to wheel jobs to beat his dust problem in the volcanic ash land that produces the famed Big Baked potato of Idaho.

Listen to Hess tell of his diesel tractor farming as worked out by himself to make his farm work both faster and more pleasant for his boys who have to operate the tractors in this volcanic dust: "I built my first four-wheel drive tractor six years ago, because I was tired of having the small front wheels of my conventional tractors mire in soft ground. The first one I worked over I sold to a neighbor. On that machine I started with little more than the rear end of a Cletrac and a 90-hp. Hercules diesel engine. Nothing about my conversion method is patented. Among advantages I claim for my hybrid are the following: (1) The four-wheel drive machines develop more power by overcoming friction in the tracks. On level ground, a man can push this big machine. (2) Wheel-mounted tractors are cheaper to operate. There are no track rollers to replace or grease. Fuel consumption is reduced substantially. As to tires, I had two recaps that absorbed six years of hard use. Tires on the big machine are 24 by 15 in. in size. (3) There is no loss of time for greasing track rolls. My sealed drive units are greased once a season. (4) The faster wheeled machines made it possible to cover more acres in a day. My wheeler tractors travel as fast in first gear as my crawler does in third. I estimate field speeds at 13 mph. on rubber as compared with 7 on tracks. (5) The rubber tires raise less dust and make for much cleaner operation. You ought to hear my kids when I try to get them to run the crawler. They holler their heads off on account of the dust!"

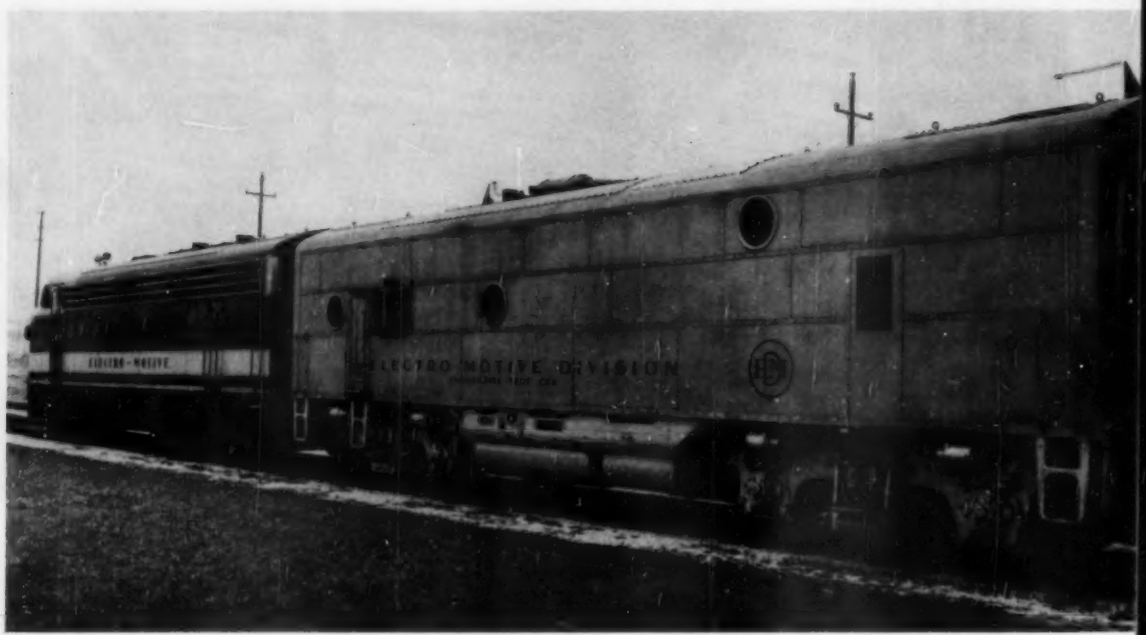
There is nothing particularly unusual about the appearance of two army trucks which Hess has worked over to suit his needs, but they are mighty useful pieces of farm equipment.

The larger one, a G.M. 6 x 6, is a good general farm truck for heavy hauling—up to 10 tons. Hess first lengthened its frame, then built a 16 by 8 ft. steel flat dump bed for it. Under full load, he gets only five miles a gal. with its present gas engine. He plans to replace it with a 145-hp. G.M. army surplus diesel. His smaller truck, a converted reconnaissance car, has a capacity of 125 bushels of wheat with 30-in. sideboards. Besides lengthening its frame 18 inches, Hess reinforced the main members top and bottom all the way through with ¾ in. by 1½ in. steel.

Hess uses the detachable boom he built on the front end of this truck for all kinds of odd lifting and moving jobs. It can handle loads up to 3000 pounds. He uses it for loading machinery and for stringing up beef and hogs when butchering. With it he hoisted into place all the timbers on the new 42 ft. by 120 ft. potato cellar he built last summer. For the 11-ft. boom he used three-in. channel iron, well cross-braced. The winch, driven from the power take-off, was standard army equipment during the war.

Not many farmers would tackle the job Hess did when he decided to pump water for gravity irrigation of 250 acres of high ground. Instead of buying a centrifugal pump, he built one. And instead of buying pipe, he welded a 500 ft., 19 in. pipeline out of 5 by 10 ft. 14 gauge flat steel sheets that he had rolled in Salt Lake City. The semi-enclosed impeller-type pump, which he operated last summer with his smaller converted diesel tractor, lifts the water 30 ft. Loafing along at about half its maximum capacity, this pumping unit delivered all the water Hess needed at an average fuel cost of 17 cents an hour for a gal. of diesel oil. Hess estimated that it would have cost him around $5 a day to run the same pump with electricity, plus a service fee of $150 a year. Hess irrigated his high ground for five years with an overhead sprinkler system—a half mile of main line and two quarter-mile laterals. Sprinkling, he commented was especially good for even watering of slopes. He changed to surface irrigation because it is faster and cheaper. Sprinklers are fine in their place, he agrees, but for his conditions surface irrigation is better.

The trailer-mounted, 150-gal. steel tank which holds the fuel for the field pumping plant was another item that Hess made himself. This winter he planned to make five more like it. With these storage tanks he believes he can save five cents a gal., on his diesel fuel next season by buying it at the oil fields in Montana and hauling home. Hess had a small homemade ditcher which he said beats any commercial ditcher he has seen. It makes and cleans round-bottom ditches with minimum damage to crops because of its short turning radius. All hard work and lifting are eliminated, he explained, with the hydraulice lift.



The nerve centers for on-the-road testing are contained in this Electro-Motive "rolling lab", an innovation in its field.

A "ROLLING LAB" ON THE HIGH RAILS

THE modern medical doctor with his kit of tools – his stethoscope, sphygmometer, electrocardiograph and all the other modern scientific apparatus for checking bodily functions and human pulsations–has nothing on the crew of diagnosticians and their special electrical recording devices which are packed into a General Motors "B" unit locomotive section, known as the Electro-Motive Test Car.

Looking at the outside of this gray streamlined car with its royal blue lettering, little would you dream that it was a laboratory on wheels, which when coupled to any General Motors Diesel locomotive or in the consist of a diesel powered freight or passenger train, certainly does a great deal more than "goes along for the ride." It takes a load of sensitive instrumentation out on the high rails to answer many questions heretofore untouched. It expands laboratory work far beyond the confines of test tracks and the stationary laboratories around the country.

There is action every minute in this novel car when it is on an assignment, for its chief purpose is to indicate or record almost anything which can be expressed as an electrical current such as temperatures, motions, stresses, accelerations, etc.

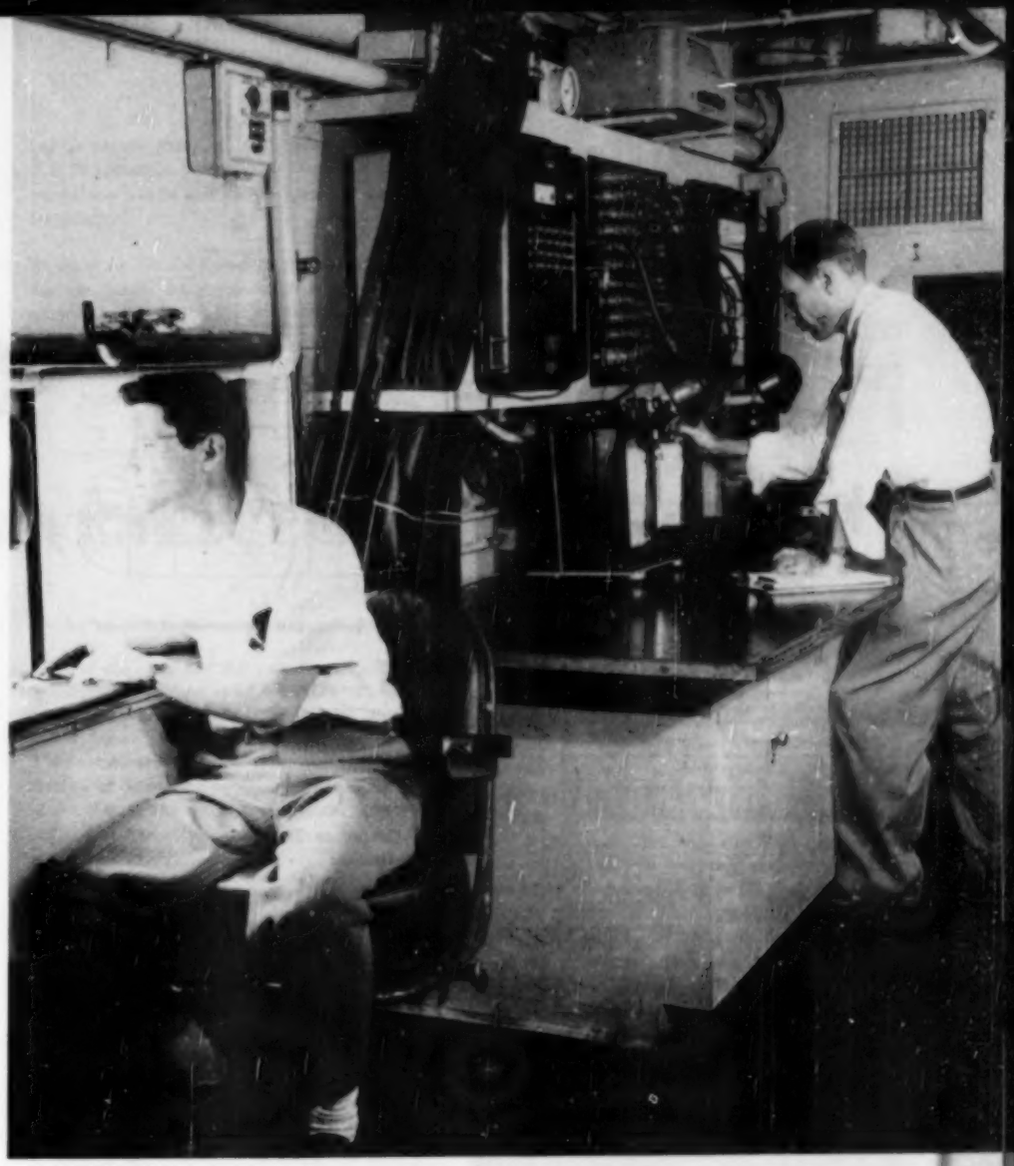
The inception of the test car took place at the Diesel Locomotive Development Center in La-Grange, Illinois, about a year ago. Heretofore, tests on the rails had to be made by portable machines, but test engineers were not altogether satisfied with such equipment. There just was no place in a locomotive to house sufficient equipment to make extensive tests before the advent of the car. In addition, many of these portable machines operated too slowly to record the very fastest pulsations necessary to supply a true picture of what was going on which the technicians wanted to know.

To view the inside of the test car will give you a good idea that the engineers realized a good portion of their dreams for more modern mobile testing equipment, but as their horizons expand so does the need for more and more experimental mechanism. Today, the car is literally filled with potentiometers, volt meters, oscillographs, electrically operated counters, cathoderay oscilloscopes and all manner of timing devices. Many of these are specially built to automatically pick up phenomena occurring at some point in a locomotive only occasionally over a period of time, while the function of others is to record the fast fluctuating electrical impulses heretofore impossible to so put on a graph.

By simply coupling this complete car–an innovation in the testing field–between any two sections of a diesel locomotive consist, the instrumentation can be brought into play upon adjoining units of the power equipment while the locomotive is in service under all cross-country operating conditions. So complete is the test car in itself that it has no dependency upon other units of the train for its operating power. It can therefore be tied in at any point on the train–between freight or passenger cars if need be. Its equipment is operated with 110 volt current developed by a separate diesel powered generator built into the test car itself. However, it has no provision made for its own motive power.

Over and above the fine instrumentation housed in the car, it provides practically all of the conveniences of home for its crew members including sleeping accommodations. No outside contact is needed for its operation save for the purpose of picking up fuel for the diesel engine, food and water for its occupants. Thus for other special tests, the car can be stationed in a yard or out on a siding, unattached for days.

The test car was built to fill a long felt need for both Electro-Motive and the customer alike. Now accurate recordings can be made by engineers of such things as the ride of the trucks, the motion of the axles, the brake pressures applied, the temperatures of the journals under all operating conditions and even the temperatures of the oils



Mileposts along the railroad right of way are clearly visible to the observer in the foreground. At his finger tips are push-button switches which set the electrical mechanism in operation in the Electro-Motive test car. Test engineer is seen making notation on tape on the speed recorder.

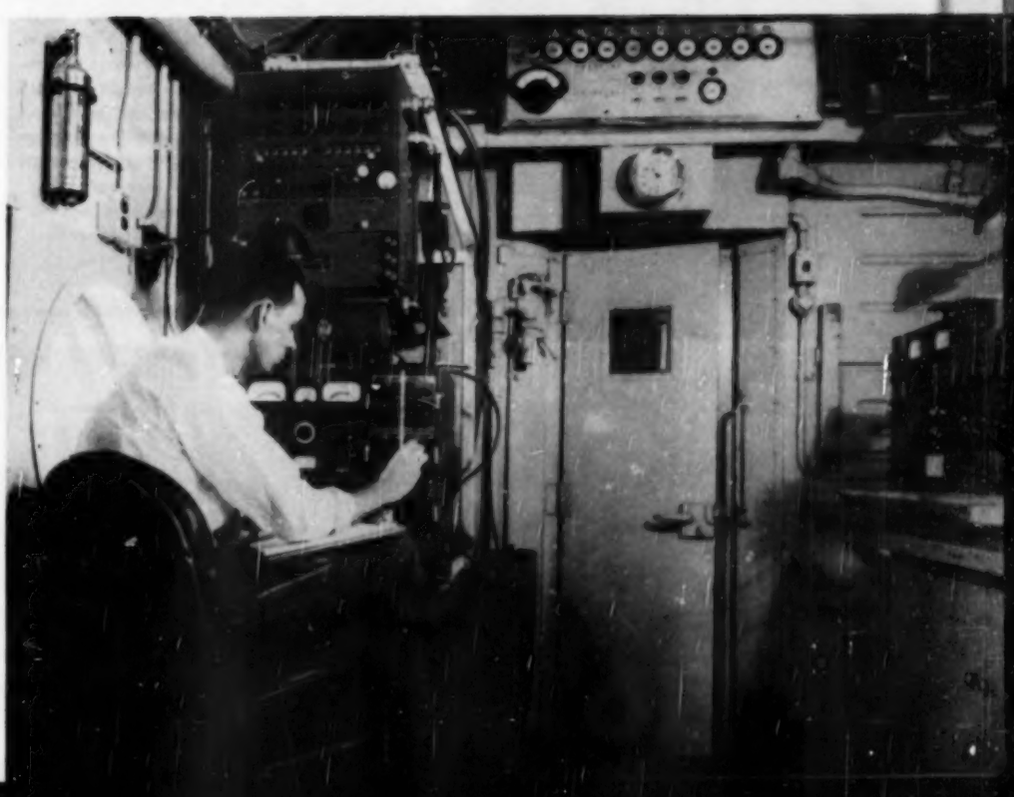
in the engines. Likewise, temperatures of the traction motors and the motion and stresses of various parts could be recorded on tape by the mile, by the minute and at the varying speeds of operation. Behavior of the diesel engines themselves is now graphed at varying elevations. Recent experiments in this line have determined the exact loss of power at high altitudes in degrees from 604 ft. above sea level to heights of 10,420 feet. Its measure is now a matter of permanent record.

The test car has proved its value many times. One good example is a case on one of America's Class I railroads where the assignment was to check the flow of power application to the driving motors of a diesel locomotive. Previous tests with portable machines had not provided the desired information. Then the test car was assigned to the task. It was coupled between two locomotive units and its instrumentation set up to record on graph paper any abnormal condition in the electrical transition system.

Serving as watch dogs, the instruments in the test car stood guard for 480 hours of train operation under all possible conditions. The actual accumulated time in which the recording mechanism automatically went into action amounted to only a few minutes. However, in that time these oscilloscopes captured data which might have required years of field survey work and testing. In reality, the phenomena itself occurred in a matter of a fraction of a second . . . too fast for even the human eye to capture the change in the impulses.

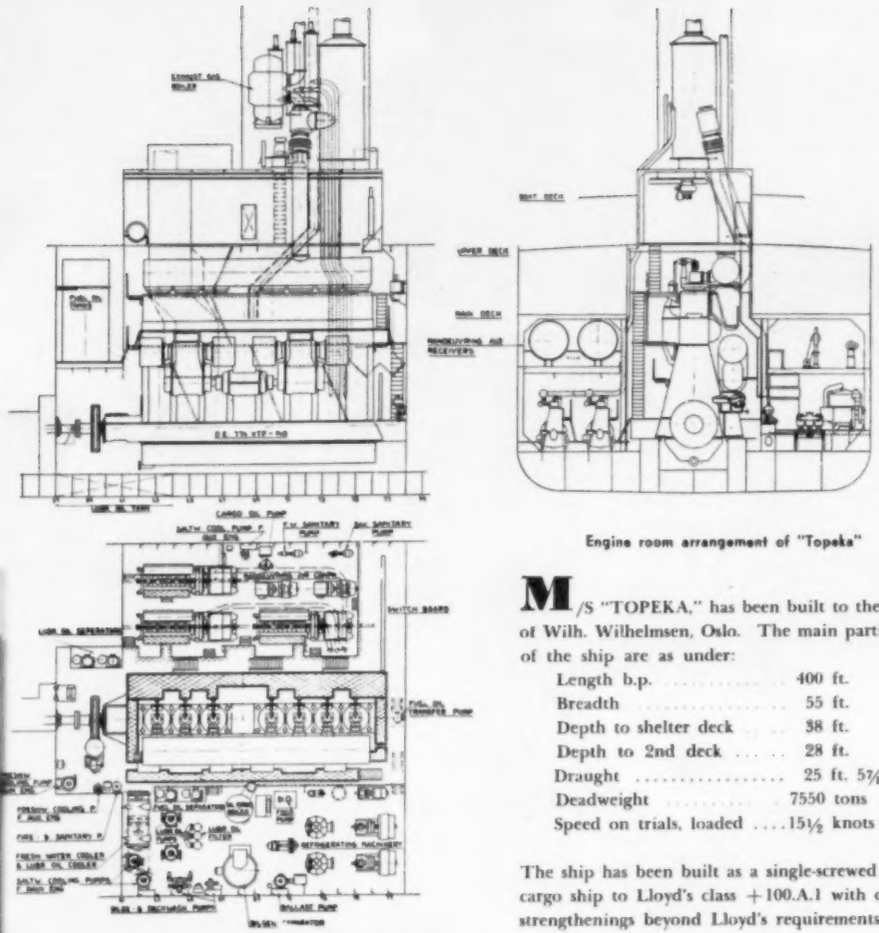
Another important aspect of the test car and its apparatus is the ability to measure electrically the full latitude of precision adjustments in the locomotive which can be caught only on the rails and which are impossible to duplicate in any stationary laboratory.

It must be remembered that in the field of scientific testing, that actual tests on the high rails prove far more reliable than any simulated situation created in a stationary laboratory. However, credit cannot all be given to this mobile set of apparatus alone. Much of this research stems from the minds of the curious test engineers. It is from their thoroughness in checking recordings that unsual discoveries are made. It is also from the progressive need for more and more equipment to measure new problems that the car itself is kept up to the minute in its recording and checking devices.



Speedometer, electrical counters and timing devices are shown above the door. The apparatus in foreground has an oscillograph above with control units below. These present an imposing spectacle in the laboratory section of the Electro-Motive test car. Both electrical recording and phone connections can be made with any other sections of the train. These are "piped" through standard connections at either end of the "lab".

M.S. TOPEKA



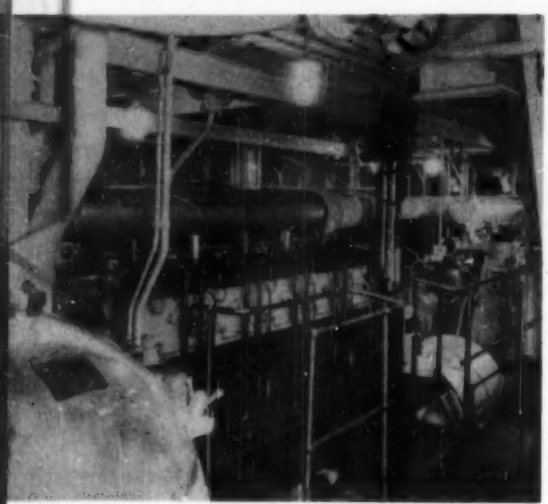
Engine room arrangement of "Topeka"

M/S "TOPEKA," has been built to the order of Wilh. Wilhelmsen, Oslo. The main particulars of the ship are as under:

Length b.p.	400 ft.
Breadth	55 ft.
Depth to shelter deck	38 ft.
Depth to 2nd deck	28 ft.
Draught	25 ft. 5⅞ ins.
Deadweight	7550 tons
Speed on trials, loaded	15½ knots

The ship has been built as a single-screwed diesel cargo ship to Lloyd's class +100.A.1 with certain strengthenings beyond Lloyd's requirements.

"TOPEKA" has 5 cargo holds, No. 3 being arranged as a refrigerated hold divided into holds for −4 centigrades and −16 centigrades. Hold No. 1 has a tween-deck, and hold No. 5, the aftmost hold, has wing tanks in tunnel height, so that the hold has a regular floor. Each hold has a hatch, in total 5, as well as a tonnage hatch. The hatches are served by six 3-ton, eight 5-ton, and one 15-ton derricks with appurtenant winches, viz. ten 3-ton, two 5-ton, and one 5-ton winch after with 2 drams and 2 warping ends. All winches including the anchor windlass are electrically driven. The steering engine is electric hydraulic.



General view of engine room

M. S. Topeka on sea trials

The superstructure consists of forecastle and poop, a deckhouse between 2nd and 3rd hatch, and round the casing another deckhouse. In the house on the lower bridge are situated the smoking saloon and wireless room as well as room for the wireless operator. The wheelhouse and chart room are found on the bridge. The house round the casing is arranged for deck and engine room officers, messrooms and galley. On the boat deck are hospital, smoking saloon for officers and room for CO_2 fire-extinguishing plant. The crew's quarters are situated in the poop.

Main engine:

The main engine is a 7-cylinder, two-stroke, poppet valve, crosshead engine with 740 mm cylinder diameter and 1400 mm stroke, developing 6400 i.h.p. corresponding to 6200 b.h.p. at 105 rpm. in normal running at sea. This corresponds to a mean indicated pressure of about 6.5 kg/cm².

Auxiliary engines:

Three 5-cyl., four-stroke trunk type engines with airless injection each direct coupled to a dynamo of 166 kw, 220 volts, 425 rpm. The diesel engine cylinders have a bore of 245 mm and 400 mm stroke. Output per engine 250 bhp.

Lubricating and cooling systems:

All big pumps are of vertical type, direct coupled to electric motors by resilient couplings. There are two screw pumps, each with a capacity of 195 cub.m/hour, for circulation of lubricating and cooling oil; further two centrifugal pumps with a capacity of 205 cub.m/hour each, for salt water cooling, and one pump of similar size for fresh water cooling. For cooling of the auxiliary engines there are two pumps of 30 cub.m/hour, one for salt water and the other for fresh water.

The lubricating oil is drawn from the bottom tank underneath the main engine and discharged through filter and oil cooler to the main engine where it is used partly for cooling of pistons, partly for lubrication of bearings, whereupon it returns to the bottom tank. The fresh water pumps drew from main engine and discharge through the fresh water cooler back to the main engine. The system is closed, and in the casing

an expansion tank is fitted. The salt water pumps draw from the sea and discharge through oil cooler to fresh water cooler and overboard. The fresh water cooler and the oil cooler are of the same type, made of steel plate and having cast iron covers, tube plates of brass and tubes of yellow metal.

The pumps furthermore comprise a vertical, self-priming centrifugal unit of 120 cub.m/hour, acting as ballast pump, a 2-cyl. plunger pump of 2 x 20 cub.m/hour, acting as bilge and sanitary pump, and finally a 40 cub.m/hour fuel oil transfer pump.

Strating air for the Diesel engine is supplied by two electrically driven two-stage manoeuvring air compressors at a pressure at 25 atm. Each compressor has a capacity of 3 cub.m intake air per minute. There are two starting air receivers with a capacity each of 12.5 cubic meters.

In the engine room is fitted a heating boiler having a heating surface of 20 sq.m, 7 atm. pressure, and arranged for oil-firing. An exhaust gas boiler of 60 sq.m heating surface and 7 atm. pressure is fitted in the funnel.

"TOPEKA" was built and engined by Burmeister and Wain of Copenhagen, Denmark.

DIESEL TUG IN VENEZUELA

By DWIGHT ROBISON

TYPICAL of the universal use of the diesel engine, three new diesel-engined tugs have recently been delivered to the Shell Caribbean Petrolum Company where they are being used in that company's extensive operations on Lake Maracaibo, Venezuela.

These tugs will be used to tow general cargo barges ranging from 100 to 600 tons carrying capacity, oil carrying barges up to 800 tons, floating cranes, drilling barges, dredger, and other miscellaneous floating equipment in Lake Maracaibo up to distances as far as 120 kilometers from base. In addition, they will be called on to make occasional towing trips to the neighboring islands of Aruba and Curacao.

Lake Maracaibo has a tidal outlet to the sea and is approximately 120 miles long by 60 miles at widest part. It is subject to sudden storms with strong winds, so that boats serving the industry must be extremely powerful and seaworthy. For this reason diesel-powered tugs were decided to be used.

Orders for the three new tugs were placed early this year. The first of these craft, the ONOTO, was delivered to her owners on April 30; the BUREDE, the second tug, was delivered May 31; and the PEMENO was accepted by Shell on June 30 and arrived in Maracaibo on July 11. All three tugs were built by the Gulfport Shipbuilding & Dry Dock Corporation of Port Arthur, Texas, and make the trip through the Gulf of Mexico to Venezuela under their own power.

Each of the tugs has the following dimensions: length, O.A., 102'2", beam, M.D., 24'0", depth, M.D., 12'4", draft, M.D., 10'1".

They are of welded steel construction to American Bureau of Shipping Classification, and were built under the supervision of J. T. Bothoff, representing the owners at the Shipyard.

Each tug is powered with a 12-cylinder, 2-cycle diesel engine, rated 1,200 b.hp. at 750 r.p.m. and driving the propeller through a reverse-reduction gear unit. Auxiliary power in each tug is supplied by two 30-kw. diesel generator sets.

The main propulsion engine is fully controlled from the pilot house and the after end of the boat deck through electric control of the air valves to the airflex clutch. A new fool-proof automatic timing device makes it impossible to inflate the astern clutch before the ahead clutch is deflated and vice-versa. On trials, the ONOTO made a speed of 11.6 knots with engine turning 750 r.p.m. and the 8'6" x 5'6" three-blade propeller turning 212 r.p.m.

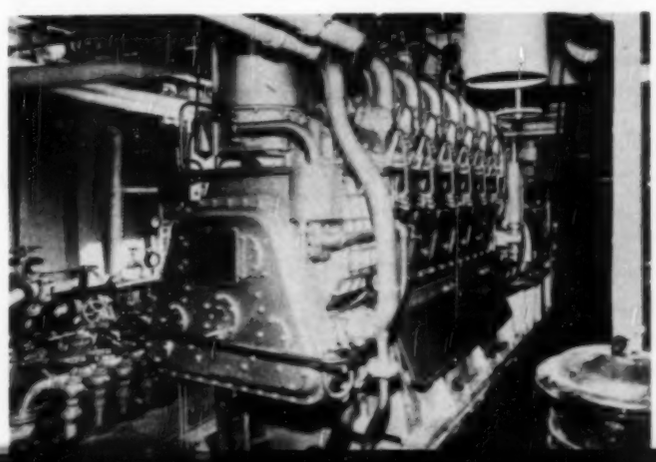
A new feature of the vessels is the 400 g.p.m. fire pump driven through the airflex clutch and reduction gear from the forward end of the starboard 30 kw. diesel generator set. This fire pump furnished water at 145 pounds pressure to fire-hose connections port and starboard on the boat deck and main deck and to the fire monitor on the wheel house. The hose connections and monitor can also be fed through a complete dual-foam proportioning tank.

Owing to the large crew necessary for operation in South America, each vessel has accommodations for twenty people, including one engineer apprentice, with combined galley and mess. Galley equipment includes a 20 cu. ft. deepfreeze box and a 20 cu. ft. day box with ice-making trays and cold water faucet. Oscillating fans are installed in all quarters and galley, and a 1½ h.p. blower exhausts air from the engine room. Accommodations also include separate toilets and showers for officers and seamen, and the captain's quarter has a private toilet and lavatory. All staterooms are provided with lavatory and shaving cabinet.

Deck equipment consists of electric full follow-up steering, 12½ h.p. capstan aft, and anchor windlass forward. The 12-person lifeboat on each tug is of the square-stern type, powered with an inboard motor, and built of aluminum, and is also used as a tender when the tug is operated off shallow river mouths, etc. The tugs are equipped with ship-to-shore radio having adequate range to keep in touch with Maracaibo at all times while in operation.

The main propulsion engine is a product of the Cleveland Diesel Engine Division of General Motors Corporation and the auxiliary diesel-generator sets are from Detroit Diesel Engine Division.

Main Propulsion engine is a G-M, Cleveland Diesel, 12-cylinder, 2-cycle of 1200-hp at 750 rpm.



Barade, one of three Shell Caribbean Petroleum Company's tugs on Lake Maracaibo, Venezuela.

GAS TURBINE NATURAL GAS PUMPING

TESTS on the commercial feasibility of the application of gas turbines for natural gas pumping units are being carried out at Wilmar, Arkansas. Selected because the necessary flexibility for such experiments were available, the site is approximately midway between the Crossett and Glendale stations of the Mississippi River Fuel Corporation's 22-inch pipe line connecting Monroe, La., with St. Louis, Mo.

The gas turbine being used is an experimental 2000-hp unit which has been on test since September 1946. These shop tests have thoroughly established the component efficiencies, fuel rates, and operating characteristics. The unit was modified by replacing the reduction gear and D.C. generators, used for shop testing, with a direct-connected centrifugal-type gas booster. This commercial application should establish the life of the high-temperature parts.

The Pumping Unit consists of a straight-through simple open-cycle gas turbine direct connected to a centrifugal-type gas booster. The complete unit, with all auxiliaries, is mounted on a single bedplate and is 20 feet long, five feet wide, 4½ feet high and weighing 26,000 pounds. The bedplate is fabricated and is rigid enough to maintain alignment of the high speed rotating parts making separate rigid foundations unnecessary and allowing the unit to be assembled at the factory and shipped as a complete package. The unit is rated at 1850 hp output to the gas booster based on inlet air conditions of 14.7 psia and 100°F temperature. Figure 1 shows an outline drawing of the unit.

Figure 2 shows a longitudinal section of the working elements of the gas turbine power unit. Free air enters the compressor at the left, is compressed to approximately five atmospheres, passes into twelve tubular type combustors where fuel is injected and burned, and then the heated air and products of combustion are expanded through the turbine and exhausted to the atmosphere. About 2/3 the turbine output is consumed by the compressor, the remainder being available to drive the gas booster. Fig. 3 shows the compressor and turbine with cylinder covers removed.

The 8750 rpm turbine-compressor shaft is direct connected to the gas booster. A small reduction gear, driven from the main shaft, is used for starting the turbine and driving auxiliaries.

The air compressor for the gas turbine is of the axial flow type designed to pass 28,000 CFM of air at a pressure ratio of five to one at full load conditions.

The compressor contains twenty three stages of non-symmetric blading designed so that the major pressure rise occurs in the rotating blades. The rotating blades, unshrouded and profiled at the tips, are forged from 15% chromium steel. The blades are machined with serrated type roots which are caulked into matching grooves in the rotor.

The stationary blades are rolled to shape and welded to shrouding to form a lightweight diaphragm construction.

The compressor rotor is a solid carbon steel forging and the compressor cylinder is made of welded steel plate. The compressor and turbine are direct and solidly connected by a jack shaft and any unbalance of thrust between the turbine and the compressor is taken up by a segmental type thrust bearing at the discharge end of the compressor.

The twelve combustors six inches in diameter and three feet long are located between the compressor and the turbine so as to provide a minimum of turning of the high velocity gases. Each combustor is interconnected for ignition purposes.

The combustor casings are made of carbon steel pipe with a bellows type expansion joint welded to the turbine end. They are clamped in place at each end by tapered flanges.

The flame tube, or inner basket, is made of chromium-nickel alloy sheet rolled into circular sections and spot welded together. When in operation, the flame is contained within this inner tube which is perforated to allow air to enter for combustion and necessary cooling.

The nozzle holders are of the bayonet type which can be extracted individually without removal of a combustor. The holders and combustors are desgned to use either gas or oil as fuel. Transfer from one fuel to the other can be quickly accomplished by removing the nozzle holders and changing the nozzles without disturbing the combustors. To maintain high combustion efficiency over the entire load range, when burning liquid fuel, a small amount of natural gas is used for atomization.

The gas turbine has eight stages designed for equal heat drops over the stationary and rotating blades. The shaft seals used are of the labyrinth type with no parts rubbing the rotating shaft. The bearings are of the pressure lubricated journal type conforming to established steam turbine practice.

All of the turbine blading is made by the precision casting method of cobalt-chromium tungsten alloy. The rotating blades are tapered and twisted and have a serrated root machined on the base. The stationary blades have a single "T" type fastening which is held in place by caulking. All of the blading is unshrouded and is profiled at the tip.

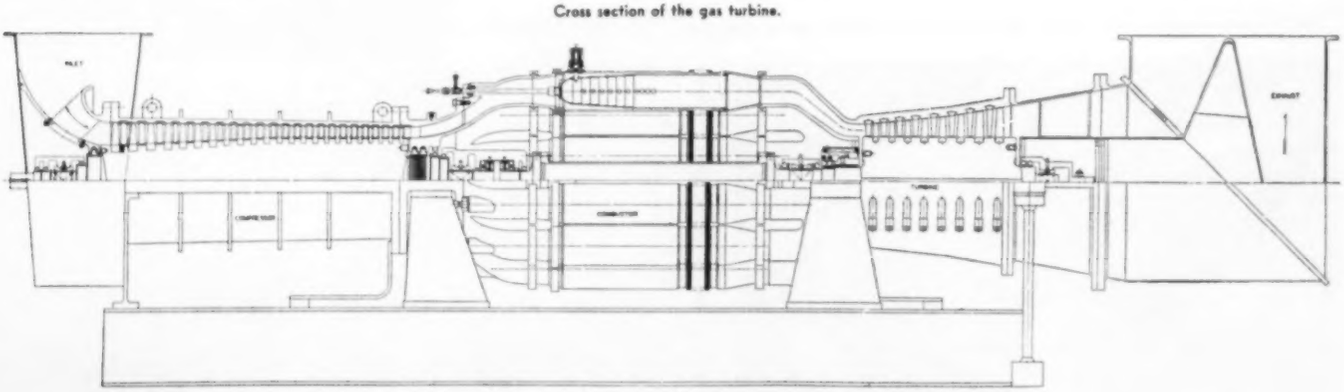
The rotor is machined from a solid forging of stabilized 19-9 stainless steel, the main section being 14½ inches in diameter and 24 inches long.

The cylinder is made of stabilized 19-9 stainless steel, grooved for holding the stationary blading. All bolting is made of stainless steel material

The turbine is maintained in alignment by using suitable mechanical hinges arranged to permit thermal expansion.

The starting motor is a 40 hp, 440 volt double extended shaft wound rotor induction motor controlled by a drum type controller and resistors.

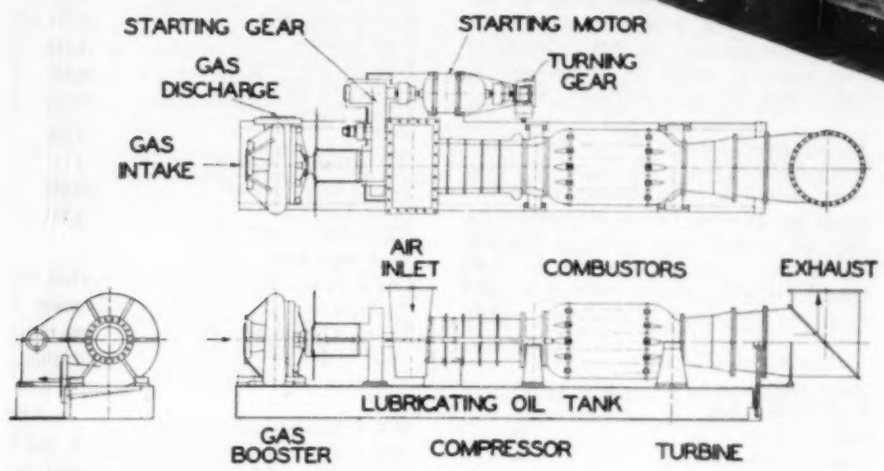
Cross section of the gas turbine.

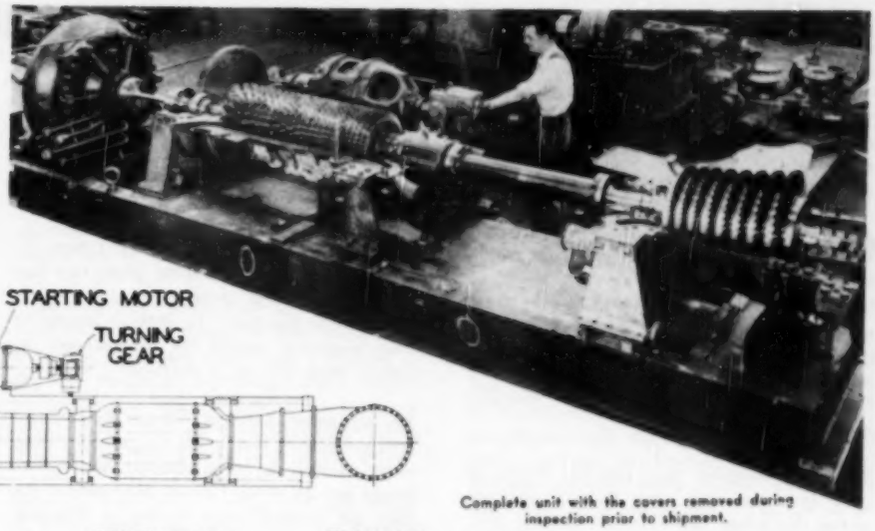


UNIT

by ANDREW G. McCONNELL

Outline of the Westinghouse-Ingersoll-Rand, experimental gas turbine, gas line pumping unit.





Complete unit with the covers removed during inspection prior to shipment.

The motor driving the main unit through the starting gear train, is capable of rotating the unit at 25% speed. After the starting cycle, the starting motor is disengaged by a disengaging coupling. On the extended end of the motor shaft is connected a turning gear for rotating the unit at approximately 10 rpm after shutdown to prevent thermal distortion of the rotating elements.

With the exception of the oil cooler, the entire lubricating oil system is contained within the bedplate. The structural steel frame of the bedplate constitutes the oil reservoir and the piping and auxiliaries are mounted along the side. A 2 hp auxiliary motor driven pump supplies lubricating oil for starting and a direct connected pump, driven by the main idler gear, supplies the lubricating oil when running. A pressure switch shuts off the auxiliary lubricating oil pump automatically as the main lubricating oil pump takes over the work.

The oil cooler is of the "Oil to Air" radiator type mounted outside of the building. A motor driven fan automatically controlled by a thermostat switch in the bearing oil supply line supplies the cooling air. This eliminates the need for any cooling water.

The gas booster is direct connected through a quill shaft and gear tooth coupling to the compressor end of the gas turbine unit. The booster is a single stage centrifugal blower with the impeller overhung on the bearings.

The booster casting is cast steel, made in two pieces, so that the entire rotor, bearings, and shaft seal is removable with the booster backplate. With this construction it is possible to remove and inspect all parts of the booster without opening any gas piping flanges. The backplate and rotor assembly can be taken out through a hole in the firewall, after first removing the coupling housing and quill shaft connecting the booster to the air compressor.

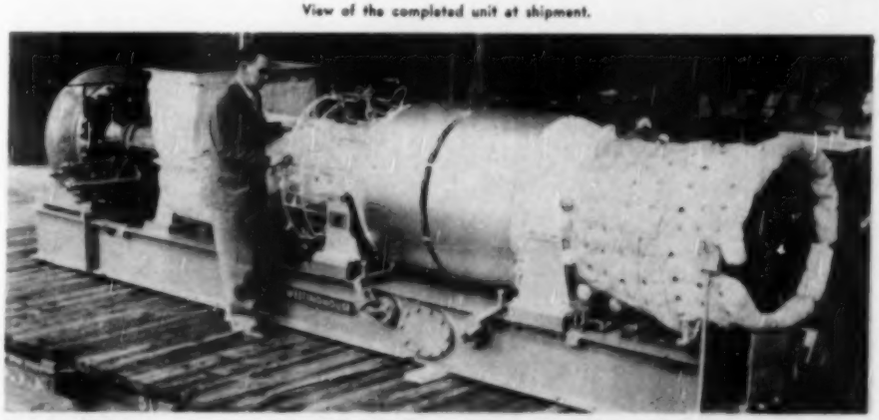
The rotor shaft is supported in two sleeve bearings with a Kingsbury thrust bearing between the two sleeve bearings. The thrust bearing takes the thrust load from the high pressure on the end of the shaft combined with the thrust developed by the impeller at running speed. Between the sleeve bearing and the impeller there is an oil seal supplied with oil at a pressure higher than the gas pressure in the casing. This prevents any gas from leaking out of the casing at the shaft.

The lubrication and seal oil system has one pump which supplies oil to the bearings and a second high pressure pump which supplies oil to an overhead tank. The oil for the oil seal flows from the overhead tank. In the event of pump failure, the overhead tank is pressurized by the gas pressure, so as to provide sufficient seal oil until the unit is shut down and all gas valves secured. The oil is cooled by a radiator type cooler with a ½ horsepower fan for air circulation, automatically controlled by a thermostat in the oil line.

The unit is protected against oil failure by two pressure switches, one to shut down the turbine in case of loss of bearing oil pressure, the other to shut down the turbine in case of dropping seal oil pressure. In the case of an emergency shutdown, the operator merely shuts the booster inlet valve and opens a blow off valve to release the gas pressure from the casing.

Westinghouse Electric Corporation and the Ingersoll Rand Company developed this unit—the former, the gas turbine and the latter, the centrifugal type gas booster.

View of the completed unit at shipment.



CONSOLIDATED FREIGHTWAYS

by CHARLES F. A. MANN

QUIETLY there has grown up in the Pacific Northwest another "Giant" with a string of "Firsts" attached to it that, within its field, ranks along with some of the big power plants. We refer to Consolidated Freightways, which, with its affiliated companies, ranks with the top Motor Freight concerns in the entire U.S.A. Portland is its home base.

The giant company now operates, barely 20 years from the time when chaotic conditions within the infant motor freight industry practically forced consolidation, coordination and standardization merely, if nothing more, in order to survive at all—in a total of 11 states, on over 14,000 miles of authorized routes, stretching from the three Pacific Coast states to Chicago and down to Utah.

Out of a total of 1317 pieces of mobile equipment, which includes practically everything that is either powered or pulled by an internal combustion engine, 270 of its largest road units, trucks or tractors, are diesel powered, with the current trend toward bigger and faster new diesel units as its truck-building subsidiary, Freightliner Corporation, builds bigger and faster and more efficient trucking units, right up to the legal limits for highways.

Its Portland Terminal and General Offices, including the fine new $200,000 production line service shop, occupy three solid double blocks in Northwest Portland. In 1948 an average of 2,361 employees worked for Consolidated, including about 600 out of Portland.

The equipment roster of the vast Consolidated Freightways fleet that roams the sub-zero, wind-swept plains of the north midwest; the congested freight arterials of the Chicago Metropolitan District; the mountain-desert reaches of Wyoming, Montana and Utah, and down to the traffic-clogged Northern California region, is as varied as its extensive spread. A breakdown follows:

(At the beginning of 1949)

Road Trucks	190
Road Trailers—Full	324
Road Tractors	46
Road Trailers—Semi	69
Pickup Trucks	418
Pickup Tractors	30
Pickup Semi-Trailers	53
Passenger Cars	119
Service Cars	22
Shop Tractors	9
TOTAL OWNED	1260 Units

Leased:

Road Trucks	15
Road Trailers—Full	29
Road Tractors	6
Road Trailers—Semi	3
Pickup Tractors	1
Pickup Trucks	3

1948 Operating Figures

Tons of Freight Hauled	559,775
Diesel Fuel Used	5,195,767 gal.
Quarts of Lube Oil	718,142
Road Miles Run	22,438,501
City or Pickup Miles	2,487,064
Trailer Miles	22,093,908
Leased (Owner-Operator)	2,453,744
Total Wages Paid in 1948	$8,180,025
Average Number Employed	2,361

It is a far cry from two decades ago when ruggedly individualistic truckmen banded together in a sort of loose holding company operating in the Portland area, to pool equipment and ability. Organized in April 1929 under its present name, with three lines then a fourth, by 1930 it added two more and covered the entire Pacific Northwest, from Portland, Seattle, Spokane and into southern Idaho. During that time, Consolidated introduced balloon tires, its first diesel, 4 and 6 wheel trailers, division rest points for drivers and began pioneering the use of rate classifications and tariffs, a novelty for the trucking industry in those days. In the middle thirties, operations were extended to the San Francisco Bay area, from Oakland to southern Idaho and beyond Spokane to Minneapolis. In 1941 the Minneapolis-Chicago line was added, and in 1943 an extension to Salt Lake City.

A moving van fleet known as Twinway; a heavy hauling division and oil tankers and huge flat bed trucks for special jobs were added. The affiliated Freightliner Corporation began building trucks, pioneering the use of aluminum in trucks, trailer frames and cargo bodies, and today is one of the two manufacturing firms of its kind in the Northwest.

Outgrowth of its manufacturing operations, came facilities for complete manufacture, design or rebuilding of any kind of truck for the custom trade, marketing of a large line of parts and accessories and fabrication of rear ends and aluminum cabs.

Now a highly synchronized giant transport com-

Consolidated Freightways truck in the Columbia River Gorge.

pany, with timetable schedules, unique rate structure and facilities for moving anything of any size or shape that can be legally hauled on the public roads, Consolidated Freightways is a shining example of a skillfully managed and technically accurate transportation system on a par with comparable mileage of rail or highway.

Its "Merry-go-round" freight handling system and unique general shops operated on a regular production line in Portland are America's outstanding twin truck terminal features. Its overhead chain conveyor system with more than 50 takeoffs on the 800 ft. carousel, is the most modern, high speed freight handling system on the Pacific Coast. Takeoffs engage telescopic masts on carts which can carry up to one ton of freight each. City pickup trucks are unloaded at one side of the freight platform where their contents are marked according to destination, loaded on carts and started around the merry-go-round.

When the carts come to the line truck on the other side of the platform, they are taken off the conveyor and the freight loaded for the proper destination. Nearly 250 such carts are used in the terminal operation.

The company's huge volume of operations, with dozens of arrivals and departures daily from long-hault points, converging from the north, northeast, southeast and south on Portland, made it finally necessary to evolve a highly efficient production line type of general shop.

Floodlighted pitlines, all interconnected below the working floor surface level, for complete check-up of the under parts of engine and chassis. Lube, fuel and oil lines are underground and airplane type ramps lead up to cabs for cleaning and servicing. Huge shop sections not only repair, but completely rebuild all parts of the entire fleet, and unit replacement is employed to service and finish the trucks and get them back on the road as fast as possible. A two ton overhead crane is used in the motor overhaul area, while a complete tire shop and instrument testing section is incorporated in the layout. Engines are rebuilt to factory-new specifications, while the break in shop for rebuilt and new diesel engines is enclosed in a soundproof room. A giant body shop is also part of the layout as well as a paint shop. There is nothing like it anywhere else in the Northwest part of the U.S.A. After long research and study of practical everyday operating problems gleaned from operating over 65,000 miles every single day, minute routines to fine down the life expectancy and its contributing part to the whole operation, ranging from the cleaning of cabs, changing injector valves on the diesels to properly sizing and matching tires on the paired rear wheels--have been worked out by the mile and by the day.

Many new chart forms have been prepared to form the basis for cumulative shop records and individual equipment records for everything in the fleet. Production line methods mean keeping the fleet on the highways instead of tied up for servicing, the time for each operation coming down as each step is fined down to the limit.

Naturally with widely varying sizes and shapes of rolling stock, the lighter units are gasoline engine driven. The giant line-haul units that pound across the western deserts and mountains naturally are diesel powered for rugged dependability in operation.

Consolidated Freightways at the beginning of 1949 operated 270 cab-over-engine diesel freightliners for transportation.

As to the shop maintenance setup on the diesels, Consolidated has a predetermined service setup for 2500 to 4500 miles which checks the entire engine so far as can be done without disassembly. At this mileage valves and injectors are adjusted, fuel pump screen cleaned and fuel feed lines checked for leaks or failures. At 25,000 mile intervals the entire truck is put on a chassis dynamometer and the diesel is run under varying loads, up to full load, and a general tune up of the engine is accomplished at this time.

Transmission, differentials and drive shafts are also checked at this time. Motor overhaul mileage is between 80 and 85,000 miles on all trucks operating west of the North Dakota line, and 95-100,000 miles on all trucks operating east of the North Dakota line, due to more level country. At these mileages the motor is completely disassembled and the engines rebuilt. If the crankshaft is over .004 flat, the entire engine is removed and a rebuilt service unit installed. In the complete rebuild operation the motor goes first into a "Motor Disassembly room" where it is completely taken apart. Then to a cleaning and hot dip tank and parts scoured and magnafluxed and removed by a crane to the motor rebuild department, where assembly and rebuilding is broken down by units. All rebuilt parts are returned to stock, and the Motor Rebuild operation draws from the stock room entirely, whether it be parts for a whole motor or a simple repair part.

Needless to mention that Consolidated Freightways pioneered the diesel engine in the Pacific Northwest. Today, in the 16 years since 1933, the entire line haul fleet, comprising all of the big mileage units is 100% dieselized. Consolidated pioneered the diesel in the cold Dakota-Montana country, where winter temperatures often drop to 50 below zero. The use of an exhaust by-pass line through the fuel tank and fully insulated fuel lines was another innovation, after learning that diesel fuel coagulates at temperatures from zero to 10 below, to say nothing of FIFTY below!

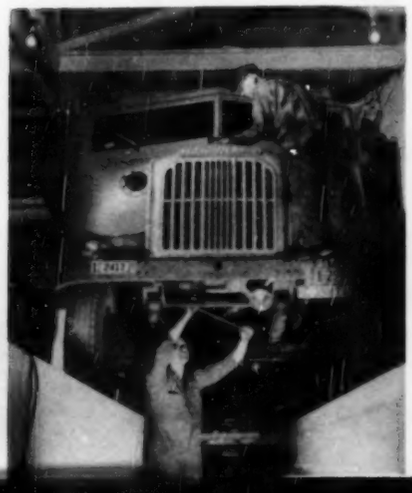
Consolidated pioneered also in continuous experiment on what type of bearing materials would work best, starting with babbitt and now concentrating on lead-copper lined bearings, with an experimental eye pointed toward use of aluminum for rod bearings.

Thus one of America's greatest motor freight lines is not only ready, but long past for experimental stage in diesels. Actually it is a richly seasoned, hugely spread diesel veteran that has worked up nearly a half BILLION diesel road miles already and hopes much more for the future of highway transport.

The diesel trucks mentioned in this article are engined by Hercules and Cummins.

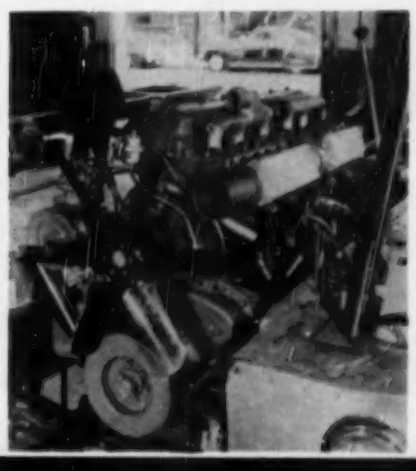
Full details of shop techniques and procedures will be outlined in an article in next month's issue of Diesel Progress. This description will be by Mr. E. B. Ogden, Superintendent of Maintenance for Consolidated Freightways. Mr. Ogden's duties require him to travel over half of the United States in the course of a year.

Servicing at the pits in the Portland general shops of Consolidated Freightways.



Orville White, mechanic and Bart Lygerson, Loadman, tightening down the rocker housing of a Cummins diesel after overhaul and before test.

Hercules diesel mounted in the chassis of a freightliner truck under construction.



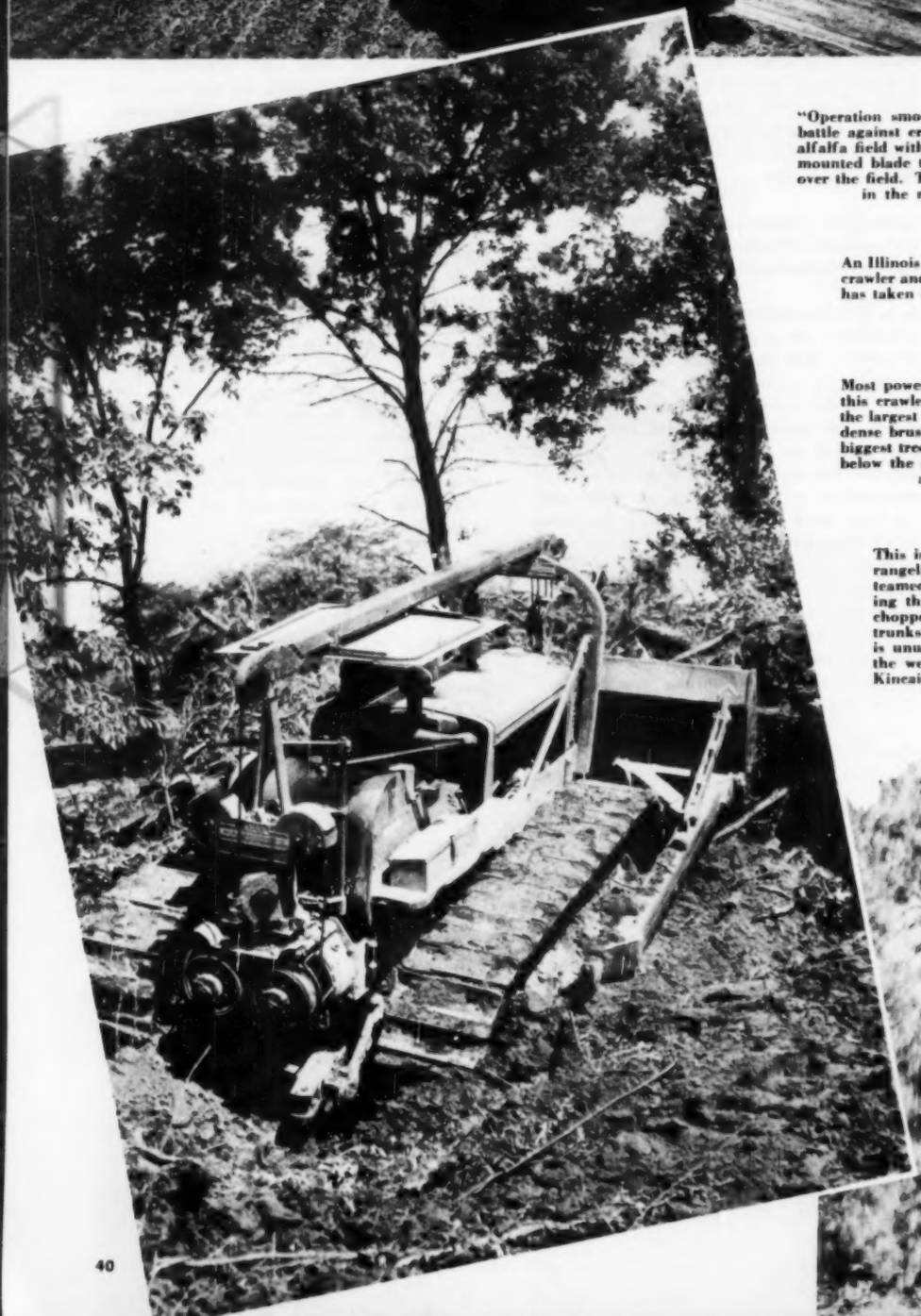
DIESEL SPEARHEAD SOIL CONSE

"Operation smooth" would describe this relatively gentle phase of the battle against erosion: another of Brown Brothers' crawlers dressing an alfalfa field with a Marvin "Landplane." The "Landplane" has a center-mounted blade that cuts down high spots and fills low ones as it passes over the field. This work keeps the land, previously levelled and graded, in the right condition for effective irrigation drainage.

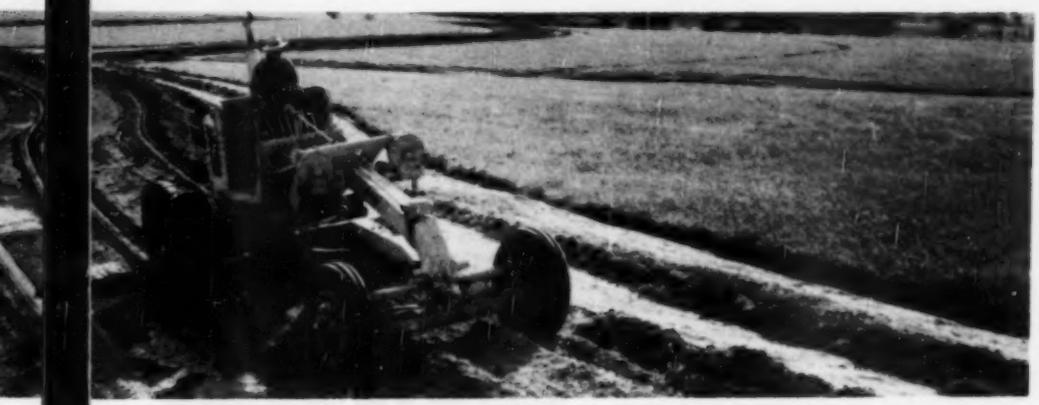
An Illinois contractor, Lynn McElroy, of Westervelt, sends this heavy crawler and another of the same model into action against brush that has taken over a pasture, and reduced its forage capacity to 20-24 head of cattle.

Most powerful weapon in the Texas drive to eradicate mesquite is this crawler, mounting a sub-surface plow with a 10 foot blade—the largest in use. This machine cuts a swath of destruction through dense brush at the rate of three acres an hour, knocking aside the biggest trees with the dozer blade at the front and cutting all roots below the reproductive underground buds. The wide plow can be adjusted to float at a depth of 12 to 18 inches.

This is a killing combination to the woody invaders of Texas rangeland—a big crawler tractor equipped with a dozer blade, teamed with a 15-foot-wide, 42,000-pound "chopper." Crashing through stands of brush, it knocks down big trees. The chopper, a hollow roller with blades 18 inches wide, smashes trunks and branches, as well as small bushes. When the brush is unusually heavy, the chopper is filled with water to give it the weight needed to smash the sturdiest growths. Frank T. Kincaid, of Uvalde, Texas, keeps this equipment busy full-time in a clearing program on his own ranch.



ERVATION CAMPAIGN



A motor grader builds ramparts against rain waters: 11 terraces and three waterways to protect a 40-acre field. Contractor Frank J. Johnson, of Omaha, owns the machine, which is shown putting the finishing touches on the longest terrace, 1,650 feet.

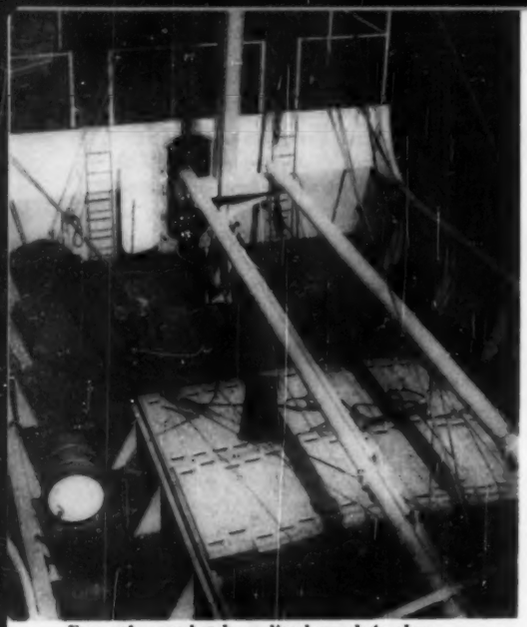
Crawlers "mop-up" on typical Nebraska gulley erosion, grading a broad, smooth waterway that replaces a ditch cut through the fields by rain waters. Here, the ditch was dammed and allowed to fill with topsoil washed down the slopes by rains. In 12 months, it was filled! The dams were then broken and the dirt smoothed and compacted for a waterway on which Brome grass and alfalfa will be planted. Worked area visible in background was a gulley 12 feet wide and 12 feet deep. These crawlers are owned by Albert Cornish of Meadow, Nebraska, who uses them for conservation work on his 800-acre farm and the fields of neighboring farmers.

INDUSTRIAL diesel power has taken over the front lines of the vital nation-wide battle to protect and expand valuable farm and range lands. Contractors—14,000 strong, according to government figures—have come to the aid of soil conservation authorities and landowners with the same mobile power tools that tame Nature for industry and commerce.

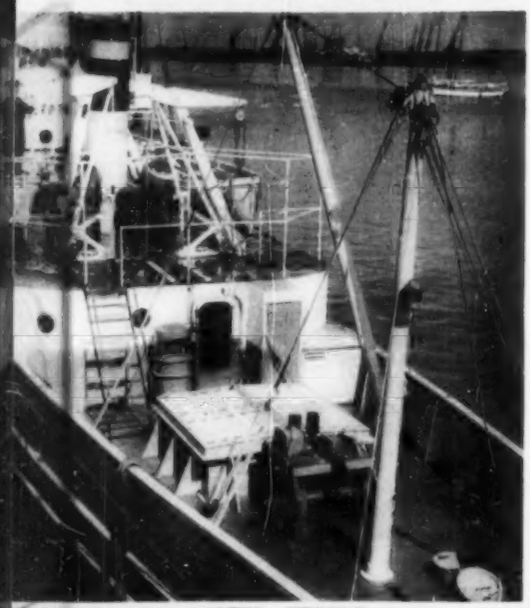
More than 32,000 contractor-owned machines, including crawler and wheel tractors, motor graders, power shovels, draglines and ditchers, are engaged in the far-flung fight to save America's fertile soils. Heading the list of heavy machines used to meet the soil conservation challenge are versatile crawler tractors—15,900 owned by contractors, another 1,000 belonging to the Soil Conservation Service and its Districts.

The soil conservation battle is at a critical stage, with the future productivity of American soil and, to a great extent the welfare of the rest of the world, hanging in the balance. In more than 2,000 soil conservation districts, covering half the land of the country and three-quarters of the farms, the fight is being pressed. And diesels are powering the hard-hitting "mechanized columns" into decisive action. The diesel crawlers illustrated in this article are built by International Harvester.

Bulldozers blitzkrieg a big erosion gulley in Nebraska, cutting down the steep walls of a ditch half-a-mile long, 20 to 25 feet deep; use the dirt to build a dam across one of the worst spots. The work was done by Brewster & Van Dusen, contractors of Blair, Nebraska. Cost was borne on approximately 50-50 basis by the landowners and the A.A.A. office of Blair.



Forward cargo hatch on diesel vessel *Azzahar*.



Looking aft on diesel vessel *Al-Akeek*.

TWO CONVERTED DIESEL

By DWIGHT P. ROBISON

AFTER service against the Japanese in the Pacific and a 4,000-mile tow across the Atlantic, two L.C.I.(L.)'s are almost ready for their next voyage—this time through the Mediterranean to the Red Sea.

The two vessels, now renamed the *Al-Akeel* (Coral) and the *Azzahir* (Floral), arrived in Southampton water last October. The Dutch ocean-going tug *Witte Zee* picked up the first at Panama and the second at Miami, and they crossed the Atlantic on a five-knot tow—a 32-day voyage.

Since that time considerable conversions and reconstructions have been carried out at Husbands yards on Cracknore Hard, Southampton, England. All alterations have been carried out to Bureau Veritas classifications to designs of Husbands made to the owner's requirements. The *Al-Akeek* and *Azzahir* will be used for passenger and cargo carrying in the Red Sea, and this has called for special attention to ventilation and engine cooling arrangements.

Lister-Blackstone, Inc., and their associates of England are responsible for taking over, conversion and delivery to the owners, the Arabian Economy & Thrift Trading Co. Ltd., of Jedda, Saudi Arabia. On arriving off Cracknore Hard, the engine room of each landing craft was stripped. This entailed removing the two quadruple 225 hp. main propulsion units with their friction clutches and reduction gearboxes, the auxiliary engines and generators, switchboards and batteries. After slipping, the reversible pitch propellers were removed together with the propeller shafts and actuating gear, "A" brackets and stern tubes.

The superstructure above the forward and after troop spaces was removed, leaving the central ship officers' and crew's accommodation, from which the partitions were removed for repositioning. The forward troop spaces were made into No. 1 hold by removing bulkhead partition. The landing ramps were cut away, and the normal hull shape built to the stern and forecastle deck. In addition 3-foot 9-inch bulwarks with ample wash plates extend from the forecastle to the midships superstructure, and from the superstructure around the new semi-cruiser stern. A sturdy foremast has been stepped aft of the forecastle, carrying two 3-ton derricks, and a stump mizzen mast with a 3,360-lb. derrick on the quarterdeck. A funnel enclosing the engine silencers, and fitted with a flame arrester, with abreast of it, carried in "Optimum" davits, two 25-foot 6-inch clinker built lifeboats for twenty-six people each, completes the new outline.

The main propulsion machinery consists of two Lister-Blackstone 4-cylinder marine diesel engines, each developing 144 BHP. at 600 rpm. at continuous rating. The engines are handed and are direct coupled to the intermediate and propeller shafts, through hydraulically operated forward and reverse gearboxes. The propellers, shafts, "A"

Lister diesel equipped motor vessel *Al-Akeek*.

Diesel tug *Witte Zee* towing *Azzahar* and *Al-Akeek* before conversion.

VESSELS

brackets and stern tubes are all of Lister-Blackstone design. Designed speed is 8 knots.

Main particulars of the vessel are:

Full displacement	384 tons
Length	158 feet, 6 inches
Breadth	23 feet, 8 inches
Draught (forward)	4 feet, 9 inches
Draught (aft)	6 feet, 6 inches
Horsepower	288 (continuous rating at 600 rpm.)
Speed	8 knots
Propelling machinery	2 Lister-Blackstone EPVMG4
Auxiliary machinery	2 Lister-Blackstone 4 JPMA
Fuel tank (4) capacity	40 tons
Fresh water tank (3)	26 tons
No. 1 hold capacity	14,000 cu. ft.
No. 2 hold capacity	3,000 cu. ft.
Liquid cargo tank capacity	94.5 tons

Plunger type circulating and bilge pumps, and a vane type centrifugal pump are driven from the forward end of each main engine which are fresh water cooled. Owing to the high sea water temperatures, up to 110°F. tropical type combined oil and water heat exchangers have been installed for main and auxiliary engines.

Two Lister-Blackstone diesel engines are installed in the wings of the engine room to supply the power necessary to drive the lighting, pumping and compressor auxiliaries. Each is a self-contained unit, being fresh water cooled and dry sump lubricated, with a tropical type combined oil and water heat exchanger supplied by a plunger type salt water pump.

At the flywheel end of each engine, a 22KW. Mawdsley 120-V DC generator is direct coupled through a flexible coupling, supplying in parallel an eight-way feeder panel. Driven from the generator shaft by an Anderton clutch is a Hamworthy self-priming centrifugal pump of 23-tons/hr. capacity. At the front of the engine crankshaft another Anderton clutch drives a Hamworthy air compressor (water cooled, 2-stage, single crank), of 26 C.F.M. working pressure 350 lbs. per square inch.

Main and auxiliary engines are started by compressed air. The six air receivers, three to port and three to starboard, of the engine room are connected to a ring main to which each engine starter valve is connected, and each of the four air compressors (two main, two auxiliary).

Forced draught air supply is provided by a 6,000 C.F.M. capacity Sturtevant fan driven by a 2½ hp. Westinghouse electric motor fitted to the quarter deck abaft the superstructure, the air being trunked to the engine room.

The four salt water circulating pumps supplying the heat exchanger take their suction from the S. W. ring main connecting the two sand and weed traps. Suction for the two main engine fire and bilge pumps and the two auxiliary centrifugal bilge pumps may be taken from this main, and may in the event of breakdown supply the heat exchangers with circulating water.

General service salt water main for the showers, wash places, lavatories, etc., is supplied by two Burks self priming centrifugal pumps driven by 5 hp. Kimble Electric motors. The sanitary header tanks being installed in the starboard side of the after bridge platform.

Ingranic float switch gear controls a Goulds' "Jet" type pump driven by a ⅓-hp. Westinghouse electric motor supplying fresh water to the galleys, wash basins, water heater and water cooler and the fresh water header tank on the port after bridge platform. Two "locking" taps are also fitted on the fore deck.

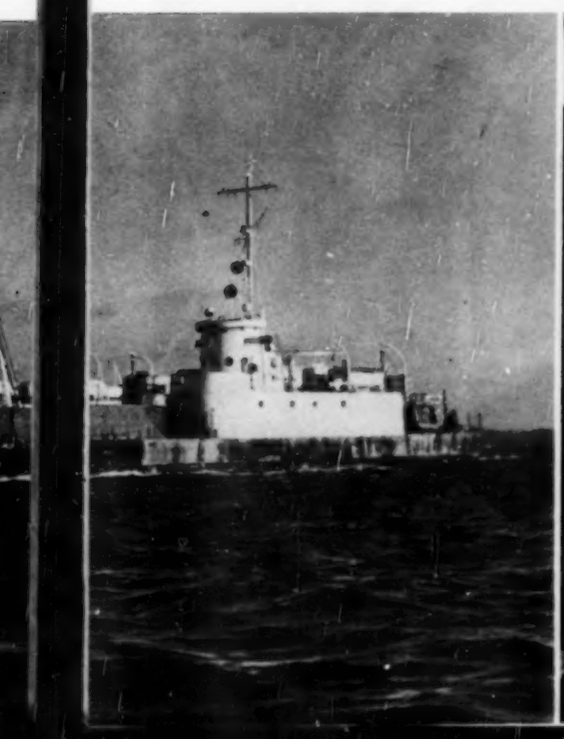
The four main fuel tanks supply, through a selector valve group ,a 25 gpm. Goulds self priming transfer pump driven by a 1½-hp. Reliance electric motor, which pumps the fuel through filters to the oil fuel header tanks. An emergency semi-rotary hand pump is fitted. These twoheader tanks supply fuel to the four diesel engines via a ring main and fuel filters.

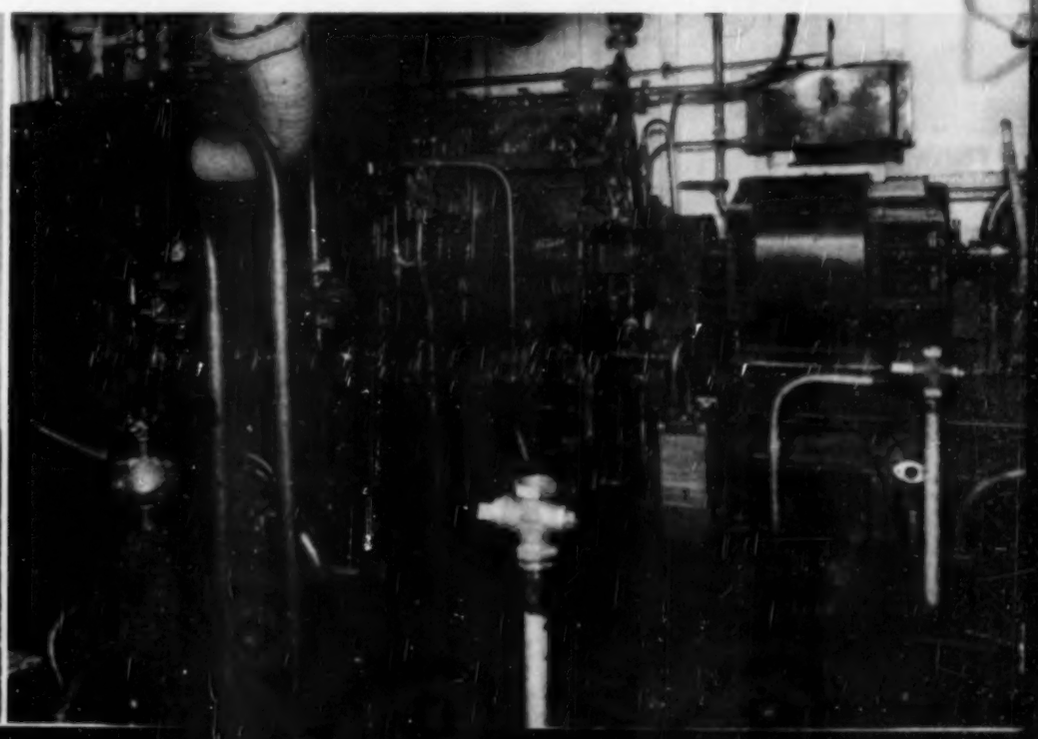
The steering gear is of the electric quadrant type driven by a 3-hp. electric motor of the Master Electric Company with Cutler-Hammer Inc. controller, working twin rudders. The main control position is in the wheelhouse with emergency electric position and a manual position in the after steering compartment where the steering gear is installed.

A gyro compass by the Sperry Gyroscope Corp. is installed in the wheelhouse with repeater in the steering flat. The magnetic compass is on the bridge. On the bridge to port are the engine room telegraphs supplied by the Bendix Aviation Corp. and to starboard the main engine throttle controls and ahead and astern controls, designed by Lister-Blackstone, Inc.

Fire main is supplied by two main engine plunger type F. & B. pumps, two electric self priming centrifugal pumps and two Hamworthy self priming centrifugal pumps. C-O Two Company supplied the fire extinguishing apparatus.

Engine room typical of both the *Al-Akeek* and *Azzahar* showing main Lister-Blackstone diesel rated at 144 hp. Circulating, bilge and vane type centrifugal pumps are driven from forward end of each main engine.





FIFTEEN YEARS OF SATISFACTION WITH DIESEL

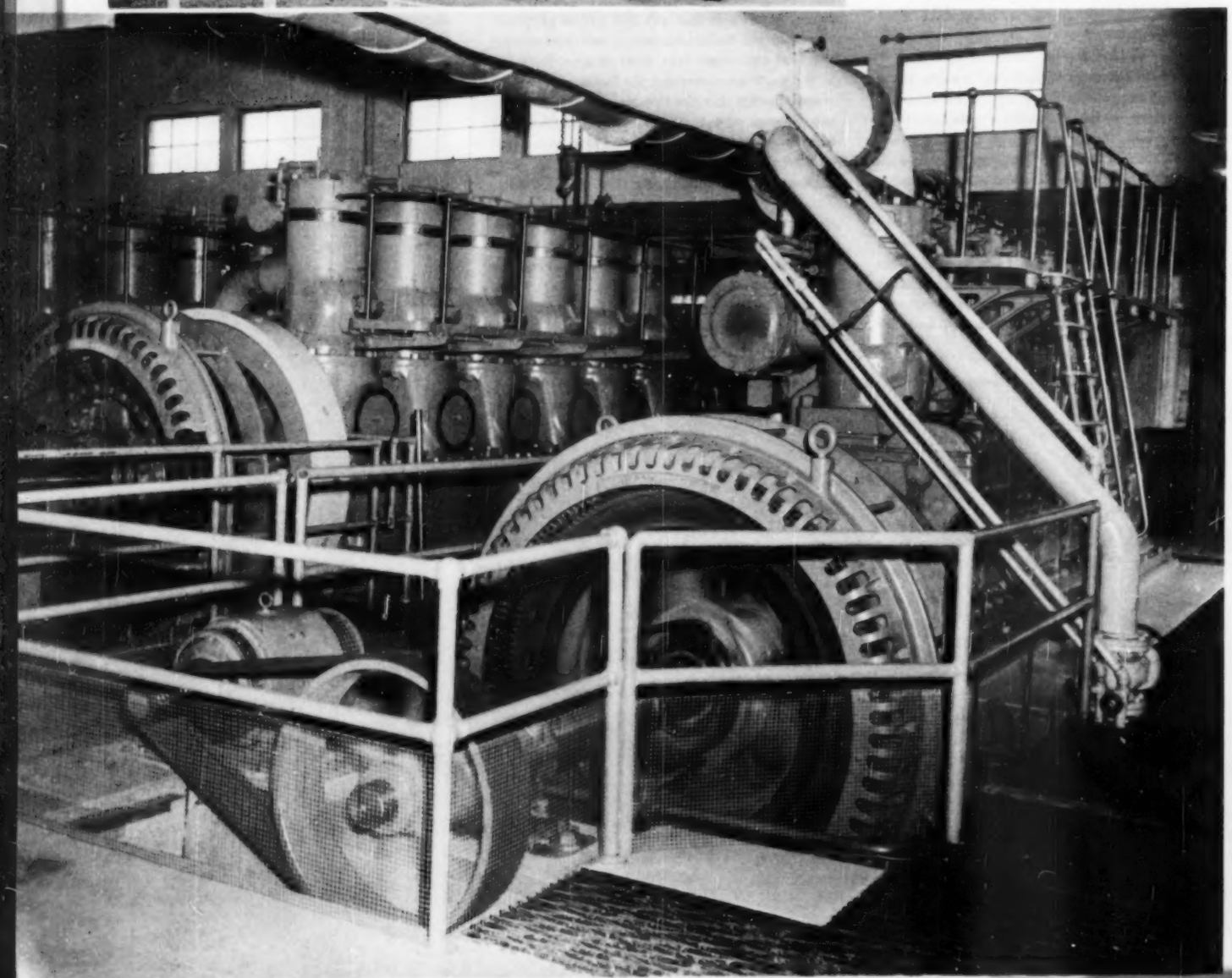
By BENNETT B. SMITH

IT SEEMS such a short time ago that the municipal light plant at California, Missouri, was established, but in November it had served the community for fifteen years. This has been years of excellent, satisfying service in contrast to the not-so-good previous years before the plant was established.

A number of years ago California had a steam plant which, for its day, was a show place and one of which any town could be proud. It followed the history of small town steam plants, however, and found coal expensive and sometimes difficult to get. Break-downs often happened, too, and the town would be without current, sometimes for quite a while.

Tiring of this arrangement, the city turned over the operation to two individuals who ran it as a commercial project. Rate for current was fifteen cents per kilowatt and service not so good.

California, Missouri, light plant.



General engine room view showing Fairbanks-Morse engines and generators.

After struggling along with more or less success for a time, the plant was sold to a utility company who closed it and ran a line from their bigger plant in Sedalia, some distance west.

Some far-sighted citizens had already been thinking of a new municipal plant for several years, and now the time had come for something to be done about it.

The first election to vote bonds called for an issue of $100,000. The city had $10,000 in a building fund which they had saved and it was planned to ask for a WPA grant of $45,000. This total amount—$155,000—it was thought, would be sufficient to establish an efficient electric power unit.

Evidently not enough advertising for the proposition had been done or those opposed had done a good job, as the vote failed to carry. Two more elections were held at varying times, but all of them failed. The failure was laid largely to opposition by the utility company, but the city attorney at that time, L. P. Embry, was determined and, as a result of his efforts and several others, bonds were finally voted.

Not much time was lost in beginning erection of a new diesel plant. A site with plenty of space, at the southwest corner of town, was secured, and here the building was erected of light red brick. It is some 40x70 feet, with steel decked roof covered with built-up asphalt. With steel window frames, the building is fireproof. The ground has been planted with trees and shrubbery, with flowers here and there.

The plant was equipped with three diesel units, 300 rpm. One unit is a 6-cylinder, 420-hp. and the other two are 5-cylinder, 350-hp. The cooling system was closed type.

After a short time in operation, it was discovered the power factor was low and capacitators were soon added which increased the power factor better than 80 per cent.

An offer by the city to buy the lines of the utility company was rejected and so a completely new system of poles and wires was constructed. Not so far away from the plant is a railroad and from this a pipe line was run through which fuel oil could be pumped from tank cars to two 15,000-gallon tanks at the plant. The city owns the meters which are supplied patrons. Homes make a deposit of $5.00 and business houses $10.00 on these meters.

After fifteen years the plant is operating at highest efficiency. When the three units were installed, it was thought there would be plenty of power for many years to come and so it has been, if fifteen years is counted as many years.

However, last year a new 805-hp. 556-kw. unit was put in to care for the load which was increasing. This cost $70,708. A larger and more modern switchboard replaced the original at a cost of $34,601.

An addition to the building costing $72,967.87 was made for the storage of materials and trucks, much of which was left in the open before, and for a basement where storage batteries were installed to furnish lights to the plant if trouble develops and power is off.

One of the old diesel units was modernized two years ago at a cost of $10,000 and another is just now being completed. This will give the utility practically new units and keep the standard of efficiency at the top.

When operation of the plant first began, there was no apparent interest in securing business from surrounding territory, but in 1946 two farm lines extending some distance and serving a number of patrons were built.

So efficiently has the plant operated, all outstanding original bonds with the exception of $15,000 have been retired or have been bought by the city. All repairs and new installations of the past year were also paid for in cash from earnings of the plant.

A complete and comprehensive statement of the assets and liabilities of the plant is issued at the close of each calendar year. The report of 1948 lists total assets as $333,402.95 and an earned surplus of $194,917.48. Total operating expense was $72,490.09, with an operating profit of $25,990.81. Total net profit was listed at $28,779.95.

In addition to this net, no charge has been made for supplying street lights. When this service was furnished by the utility company, the annual cost was about $4,000. The city has increased the number of street lights by about 33⅓ per cent and has added to the size of most of the lamps.

Rates for current for residences start at 7½ cents for the first 40 kwh. and extend down to 3 cents for all over 80 kwh. Commercial rates begin at 7½ cents for the first 40 kwh. and decrease on scale to 3 cents for all over 200 kwh. Minimum monthly charge is $1.00. These rates were established at the beginning of the new plant and have remained the same.

Year	Kwh. Operated	Operating Income	Operating Expense
1935	803,400	$30,300.41	$21,312.62
1936	959,900	30,962.43	21,422.17
1937	1,072,600	38,025.39	25,539.46
1938	1,173,800	39,862.27	23,703.19
1939	1,261,800	43,670.41	24,793.82
1940	1,296,700	46,599.56	25,448.34
1941	1,402,600	49,704.40	28,323.80
1942	1,435,900	49,395.95	27,207.50
1943	1,391,700	48,621.80	28,308.35
1944	1,398,000	50,016.41	29,561.34
1945	1,413,000	53,151.19	30,860.13
1946	1,636,000	61,749.57	35,376.44
1947	2,058,800	77,319.40	47,288.77
1948	2,296,600	84,368.11	61,523.08

Year by year record of savings earned and made by diesels at California, Missouri.

Since 1939, there has been an annual dividend credited to all customers amounting to from 8⅓ per cent to 20 per cent of all billings for the year. These dividends have been as follows:

1939	$ 3,865.78
1940	3,179.88
1941	4,391.66
1942	5,450.91
1943	7,387.09
1944	7,379.08
1945	7,768.39
1946	10,797.67
1947	10,455.11
1948	6,965.74
Total	$67,469.31

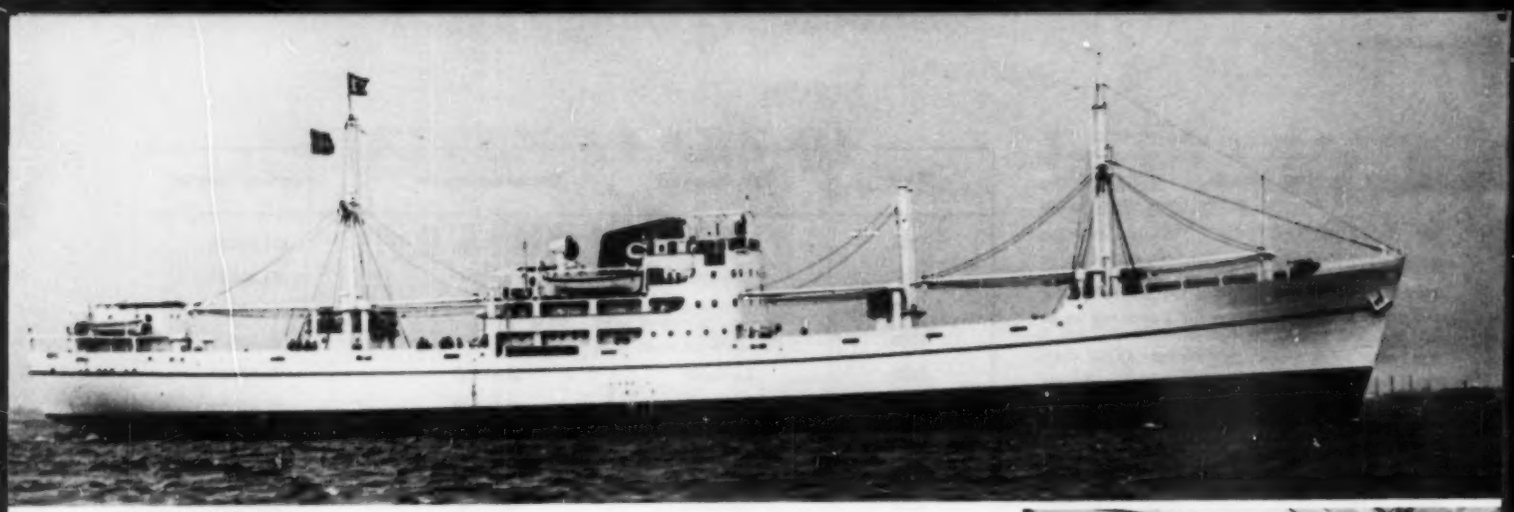
These dividends are used in lieu of rate adjustments until conditions have become more stable.

During the fifteen years the unit has been operated, it has shown an increase almost every year. The years 1943 to 1945 showed a slight decrease in kwh. generated, but from 1946 there has been a gradual increase each year. The accompanying table shows the operating income and expense with the number of kwh. generated each year.

The plant is operated constantly by four engineers headed by Lloyd Topliff, superintendent.

Machinery Used in California Plant

Fairbanks-Morse Diesel engines: 32-D-14, 300 rpm; 1 420 hp., 2 350 hp; 1 33-2-14, 805 hp.
Woodward governors, type I. C.
Westinghouse regulators.
General Electric relays.
Roller-Smith switches.
Marley heat exchangers.
Fairbanks-Morse cooling system.
General Electric capacitators.
Westinghouse and Sangamo meters.
Westinghouse switchboard.



M.S. Jytte Skou on trials.

M. S. JYTTE SKOU

By DWIGHT P. ROBISON

ON September 15, 1949, *Jytte Skou* had her trial trip in the Sound. *M.S. Jytte Skou* is the second motorship built for Mr. Ove Skou. The first motorship was No. 672, *M.S. Benny Skou*, built in 1945. So far, these two vessels are the only motorships in the fleet of this owner, but still another fast motorship of about the same type is being built by Burmeister & Wain.

The ship has the following main dimensions:

Length p. p.	365 feet, 0 inches
Breadth moulded	55 feet, 6 inches
Depth to main deck	26 feet, 6 inches
Depth to shelter deck	35 feet, 0 inches
Draught	24 feet, 4½ inches
Deadweight	6,650 tons
Gross tonnage	3,884 tons
Speed loaded on trial trip	14.5 knots

The ship has been built to Bureau Veritas' class as a single-screw diesel cargo ship with accommodation for 12 passengers.

M.S. Jytte Skou has five holds and a deep tank for vegetable or fuel oil. The holds have a hatch each, and are served by a total of 10 derricks for five tons; besides, the foremast carries a 25-ton heavy derrick at No. 2 hatch. The heavy derrick can be shifted to the main mast at No. 4 hatch. The derricks are served by ten 5-ton winches. Two warping capstans are placed aft. All winches, including windlass and steering gear, are electrically driven.

The superstructure consists of forecastle, a house amidships around the engine room casing, a house aft, a house around the main mast, and a house between No. 2 and No. 3 hatches. The house amidships is arranged for deck officers and engineers with mess rooms, smoking saloon, and galley. The house on top of the promenade deck has a smoking saloon forward and a dining saloon with pantry aft. Furthermore, this deck has two 2-berth cabins and six single-berth cabins, all with bathrooms. Four of the single-berth cabins can be turned into two 2-berth cabins by means of sliding doors.

A house on the boat deck amidships contains hall and owner's room, also with bathroom, together with captain's living room, bedroom and bathroom. On the after edge of the boat deck is a special house for ship's hospital, also with bathroom.

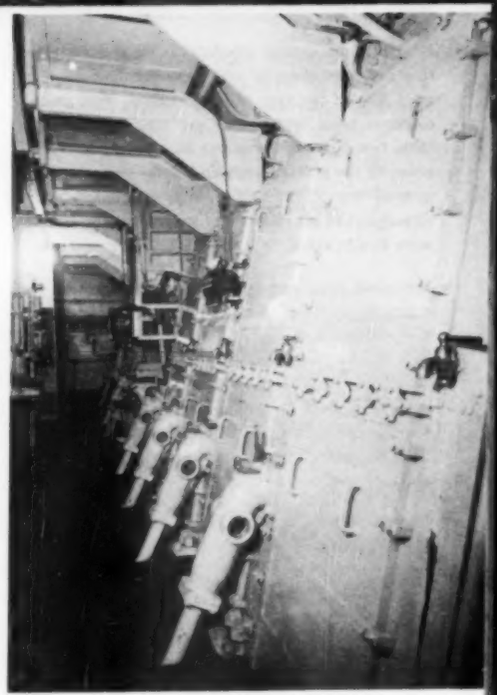
On the bridge are wheel house, chart room, wireless station and operator's cabin, and pilot's cabin. The aftmost mast house accommodates boys and stewards. The crew's cabins are placed aft on the shelter deck and are made up entirely of single-berth cabins.

In the deck house aft are mess rooms for sailors and motor men, and in the deck house above are cabins for sailors, and a living room.

The provision room is placed under the galley, and consists of a refrigerated chamber of 300 cubic feet for meat and one of 400 cubic feet for vegetables, besides an ordinary provision room and a sealing room.

The ship has steam fire extinguishing system and the necessary hand operated extinguishers.

The ship will be fitted with wireless, wireless direction finder, electric log and echo sounder.



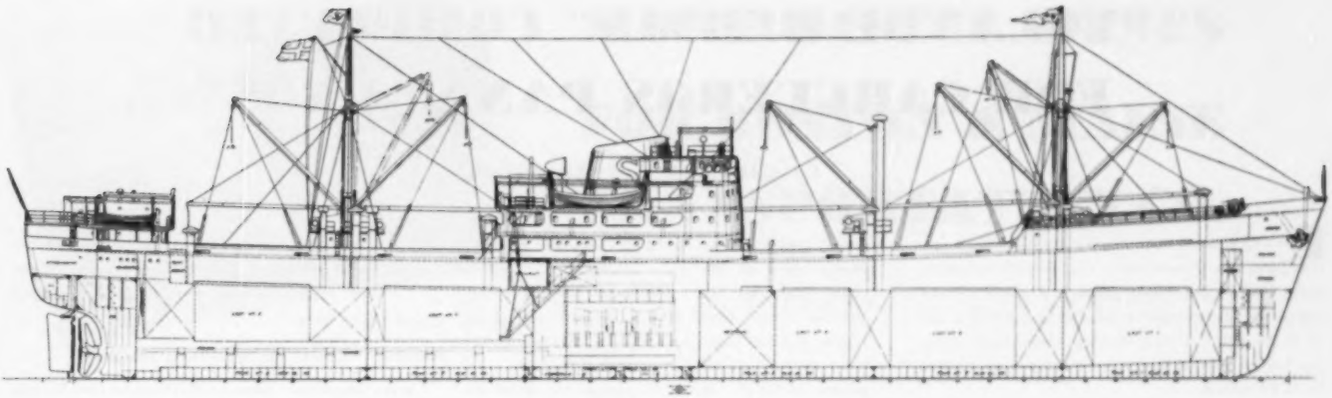
View of main propulsion Diesel Burmeister & Wain engine.

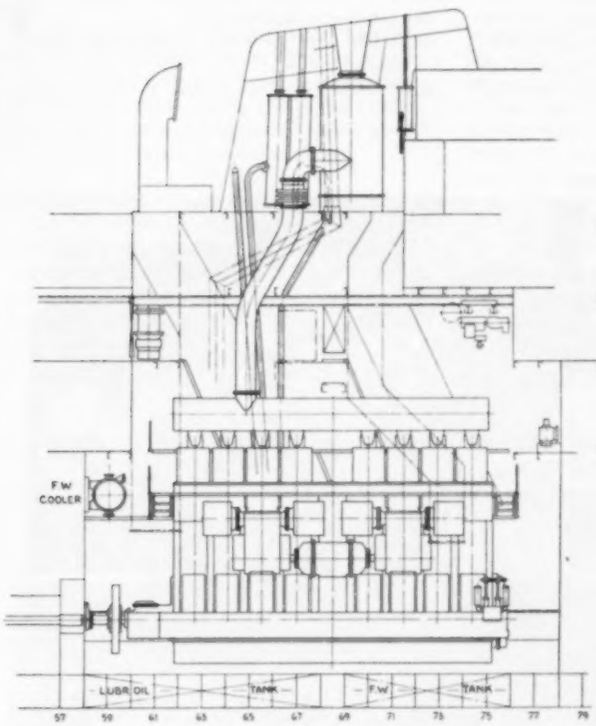
One direct reversible, single-acting, two-stroke, 8-cylinder Burmeister & Wain crosshead diesel engine with airless injection. Cylinder diameter 620 mm, stroke 1,150 mm, capable of developing 5,000 i.h.p., corresponding to about 4,050 b.h.p. at 125 r.p.m.

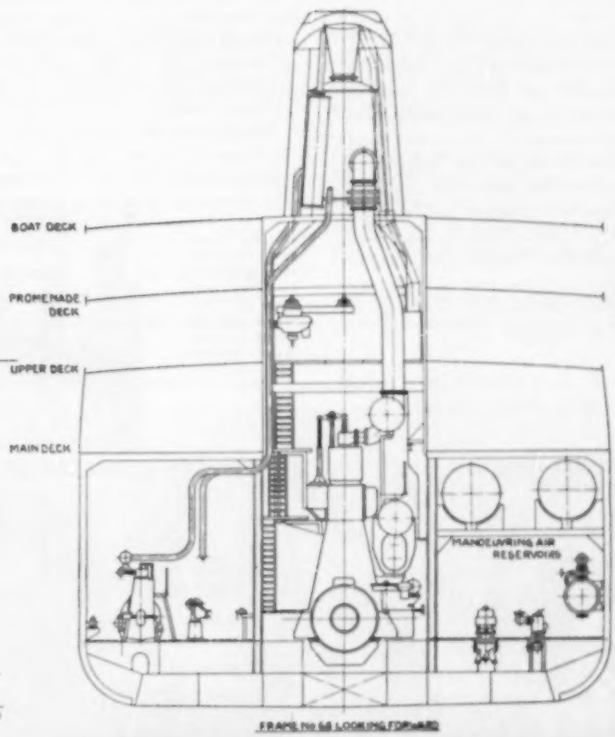
Three 4-cylinder auxiliary diesel engines of Burmeister & Wain's single-acting, 4-stroke trunk type with airless injection, each direct coupled to a dynamo of 150 kw at 220 volts and 500 r.p.m. Cylinder diameter 245 mm, stroke 400 mm. Output per engine, 225 b.h.p.

A heating boiler with a heating surface of about 24 cubic metres, designed for a working pressure of seven atms., will be fitted in the engine room. It is made for oil firing.

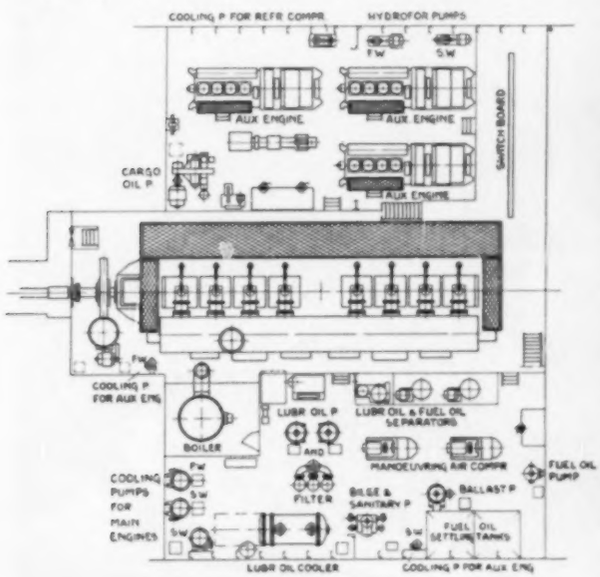
This vessel was built and engined in the famous Burmeister & Wain yards at Copenhagen, Denmark, one of the world's famous yards.

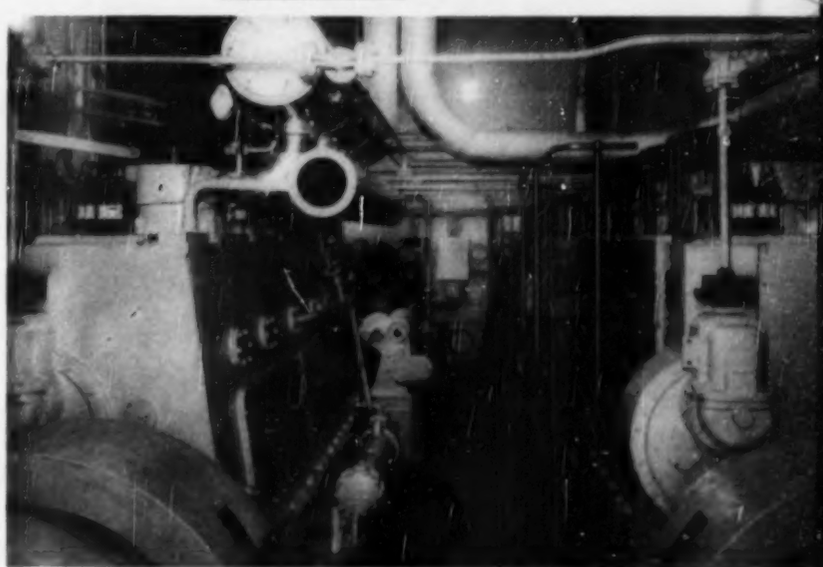






Engine room layout and sectional drawing of *M.S. Jytte Skou*.





General engine room view showing Burmeister & Wain auxiliary Diesels.

"YOLANDE BERTIN" COMPLETED FOR CARGUEROS PANAMENOS

by CHAS. F. A. MANN

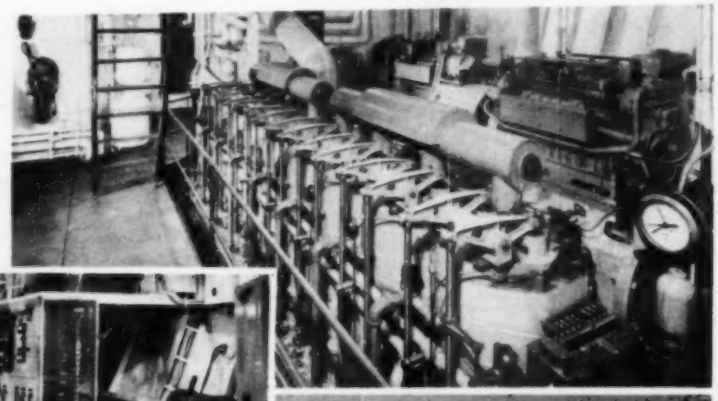
LATEST steel tuna clipper to join the Southern Tuna fleet, particularly that branch operating from Central American ports is *Yolande Bertin*, completed in September for the account of Capt. O. E. Bertin, Los Angeles ship and fishing operator, for account of Cargueros Panamenos of which he is President.

Yolande Bertin is 104 ft. 8 in. x 26 ft. 6 in. x 11 ft. depth, and with a capacity of 200 tons of fish and carries 10 refrigerated fish holds, of which are combination fish tanks and fuel oil tanks for the outbound voyage, and 3 refrigerated bait boxes on the main deck. Of welded steel construction, heavily insulated and quarters in fir and mahogany plywood, the vessel is a high type of Tuna Clipper construction and last in a long line (over 125) Clippers from Tacoma Boatbuilding Co. of Tacoma. Arthur De Fever of San Pedro is Naval Architect on the job and mechanical layout was supervised by Haldor Dahl, Vice President of the shipyard.

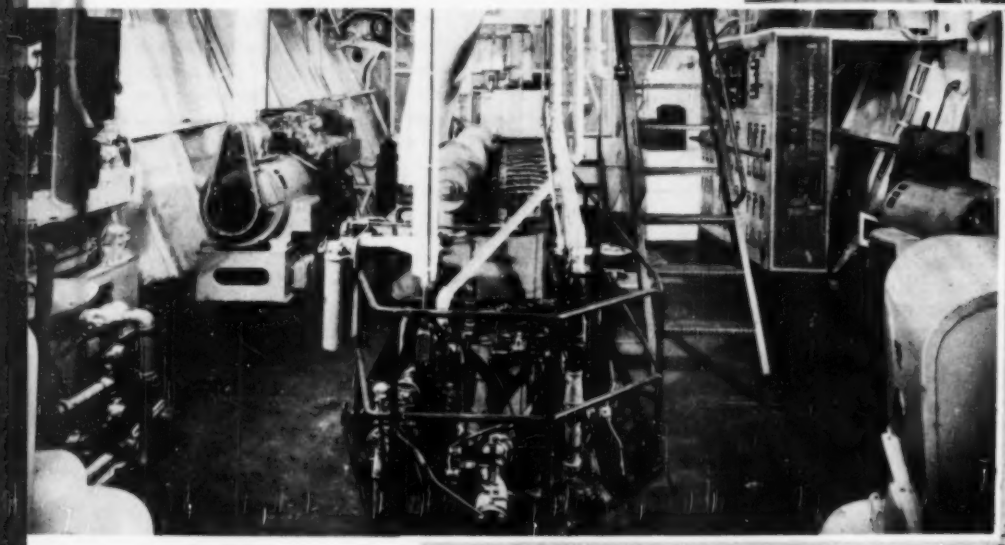
Main propulsion is an 8 cylinder diesel rated at 550 hp. at 360 RPM, driving through a 6 in. monel metal tailshaft, a 72 in. propeller. Three diesels rated at 100 hp. each drive 75 KVA 3 phase, 220 volt A.C. generators for the heavy auxiliary load. Three 20 hp. refrigeration pumps supply the fish tanks and a 3 hp. unit the galley box. A 7½ hp. auxiliary motor driven air compressor is fitted. Some 18 pumps are fitted for brine, fire, salt water circulation and bait pump water handling, and two sanitary pumps. Welded galvanized iron piping carries the refrigeration to all 13 fish tanks. 28,290 gallons of fuel oil are carried, including 9750 gallons in the two dual use fish tanks, and 4200 gallons of fresh water and 1250 gallons of lube oil. The ship carries a chapel, large galley, quarters for captain, owner and 16 crewmen.

SOME OF THE EQUIPMENT

Main propulsion engines—Washington Iron Works.
Auxiliary diesel-generators—General Motors.
Refrigeration pumps—Howe.
Brine, salt water, fire and bait pumps—Fairbanks-Morse.
Stern bearing—Goodrich Cutless.



Engine room view showing main Washington diesel and two of the three General Motors auxiliary diesel - generators.



General engine room view looking aft.

Yolande Bertin on her trials.

New diesel engined bus of the Boston and Maine Transportation Company.

MORE DIESEL BUSES FOR BOSTON & MAINE TRANSPORTATION CO.

By CHARLES F. A. MANN

LIKE its parent, the Boston & Maine Railroad, Boston & Maine Transportation Company, serving many local points formerly served by unprofitable shorthaul rail transportation plus points further out in the expanding population pattern, is going diesel. 37 buses of the fleet are now diesel.

Nine new diesel buses have just been put into service, five of which are 37 passenger deluxe and the other 38 passengers. They will operate between Boston, Lowell, Worcester, Mass., and Concord & Laconia, New Hampshire, bringing the B. & M. bus fleet to 113 units in service in New England.

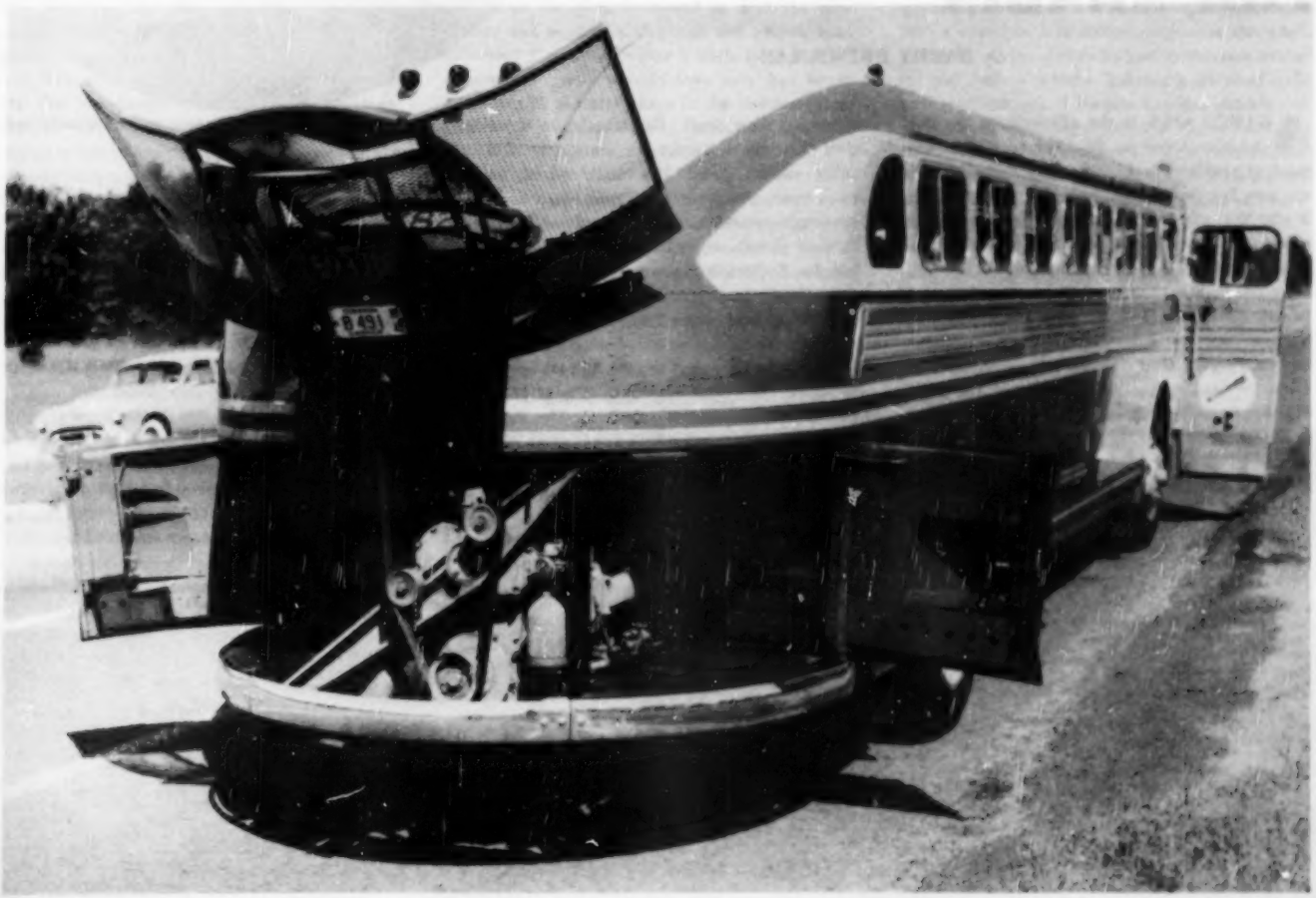
Improvements include slip proof floors of non skid rubber; individual reading lights; elaborate air conditioning; new two-step entrance; improved air brake compressors and extra large fuel capacity to enable them to run between 700 and 800 miles without refueling. The buses are 35 ft. long from bumper to bumper and have the latest reclining seats. The present B. & M. fleet consists of 37 diesel buses and 76 gasoline.

Diesel engines on the new buses are the 4 cylinder 2 cycle type, with 284 cubic inches displacement; 4½ in. bore and 5 in. stroke. Brake horsepower at 2,000 RPM is 132.5 with 16 to 1 compression ratio. This is a new hydraulic transmission specially designed for diesel drive, which gives the buses smooth powerful starts.

A company official desiring not to be named says: "From our long experience with both types of buses, future bus replacements and additions to the fleet will be diesel instead of gasoline driven buses, especially the larger sizes."

The busses described in thiq article were built and engined by General Motors Corporation.

View of the new bus showing engine compartment open.



Good looks and high speed are qualities rarely found in rugged work boats, but the new Aramco fleet is a noticeable exception. Shown here is the 60-foot Staff Personnel Boat now operating between Bahrein and Ras Tanura in the Persian Gulf.

A "maid of all work" is this 65-foot diesel powered Fellowscraft recently placed in commission by the Arabian American Oil Company. She performs the duties of fire, tug and pilot boat in the waters of the Persian Gulf.

DIESEL WORK BOATS FOR ARABIA

By HARRY BRINCKMAN

ARAMCO which is the abbreviation for the Arabian-American Oil Company, in its expanding activities in Arabia, has a thousand and one uses for dependable, seaworthy boats, which is why they ordered built in Los Angeles harbor a fleet of modern, high-speed diesel personnel and general utility boats. From designs by Dair N. Long and built by Fellows & Stewart at Terminal Island, California, five of these boats are now proving their worth in the company's operations on the Persian Gulf. Three are personnel carriers, two are unique modifications of the basic hull design, serving as combination pilot, tug and fire boats.

Utilizing a modern V-bottom hull, the builders were able to meet the requirements of speed, maximum capacity and sea-going ability in a boat of very shallow draft. Construction is of welded steel throughout, except for seats, trim and interior cabinet work. Essentially sound, honest work boats with very few frills, these new Fellowscraft nevertheless reflect a bit of the yacht in their smooth, crisp lines. This is not surprising, for Fellows & Stewart have been one of the West Coast's leading builders of yachts as well as commercial craft since 1896.

Basic boats of the fleet are the 60-foot open-sided personnel transports with a capacity of 81 seated passengers, exclusive of operators. The staff personnel boat provides seating for 54 in an enclosed cabin and has two additional toilet rooms. The multi-purpose pilot boats are 65 feet over-all and, in addition to fire fighting equipment, have a galley, refrigerator and other refinements for longer runs offshore. Hulls of these boats are metalized with zinc.

A cruising speed of 14.5 knots is attained by these boats with power delivered by twin G.M.6-71 diesel engines of 200-hp. each, driving through 2-to-1 reduction gears. Additional power installations in the pilot boat include a 650-gpm. fire pump driven by a G.M. diesel model 2-71, and a 20-kw., 110-vac., G.M. diesel generator set. Other equipment includes: Federal propellers, Lux fire extinguishers, Link radiotelephones and Kelvin-White compasses. All five boats were shipped from the Terminal Island yard of Fellows & Stewart as deck cargo and were ready for immediate service upon arrival in Arabia. The owners report that all units of the fleet are delivering the highly efficient service expected of them.

Fast and seaworthy, this 60-foot personnel boat is one of a fleet of five recently completed for Aramco by Fellows & Stewart of Terminal Island, California. Seated capacity is 81 persons exclusive of crew. Dimensions are: 60-foot length overall, 16-foot beam, 3-foot draft.

FARMING A LAKE...

Thanks to Diesel-Pump Team

By WILLIAM H. GOTTLIEB

Lima Lake drainage district pumping plant, showing main drainage ditch.

THE 5,000 acres of fertile soil that were the bottom of Lima Lake provide a rich yield of crops year after year, but only because three diesel-driven 42-in. pumps keep rainwaters from refilling the natural basin. Farming poses some special problems in these bottom lands along the Mississippi, lands well below the prevailing level of the river. The levees keep the river in check but obviously the farmer cannot count on natural drainage to dispose of rainfall. Waters that flow from adjoining highlands and rains that the soil cannot absorb must, of necessity, be pumped up to the river level.

Even prior to 1939, when Lima Lake was still a peaceful body of water a dozen miles north of Quincy, Illinois, and a couple miles east of the river, there were pumps at work in the 14,000-acre area that constitutes the Lima Lake Drainage District. The highest land in the district is less than three feet above prevailing river level, scarcely a safe margin, and nearby Bear Creek's fluctuations were an added peril. When the steam-powered pumps then employed outlived their usefulness, the landowners decided to install motor-driven centrifugal pumps capable of draining Lima Lake and keeping the entire expanded district free of excess water.

The lake was pumped dry in 1929 and the plant continued to function through 1939, except for the flood years of 1935 and 1936 when the levees gave way. During the first 73 months of operation, the plant was operated at the overall total cost per acre ft. of $.58.

At this point the consulting engineers, McCann & Klingner, determined that it would be advantageous to replace the centrifugals with pumps more efficient at the low heads prevalent through most of the year and to supplant the electric motors with diesel engines. Consequently the district installed in 1940 three 42-in. horizontal propellor-type Fairbanks-Morse pumps driven through v-belts by three variable-speed Fairbanks-Morse diesels rated at 250 hp. at 800 rpm.

At this writing, complete cost figures are available on six full years of operation of the new plant (not counting the flood year of 1944 when the levee broke) and the judgment of the engineers has been fully vindicated. The cost of pumping an acre ft. per ft. of lift has been *reduced fully 61 percent* below equivalent costs in 1939, the last full year of pumping with the old pumps and purchased power.

Equivalent pumping over the same period with the old plant would have cost more than $133,000.00, which means that the new equipment effected a saving of *more than $81,000.00* in just six years. The new equipment and plant alterations cost a total of $65,000 and, depreciating at the conservative rate of 5 percent per annum, the district calculates a net saving of $61,500.00.

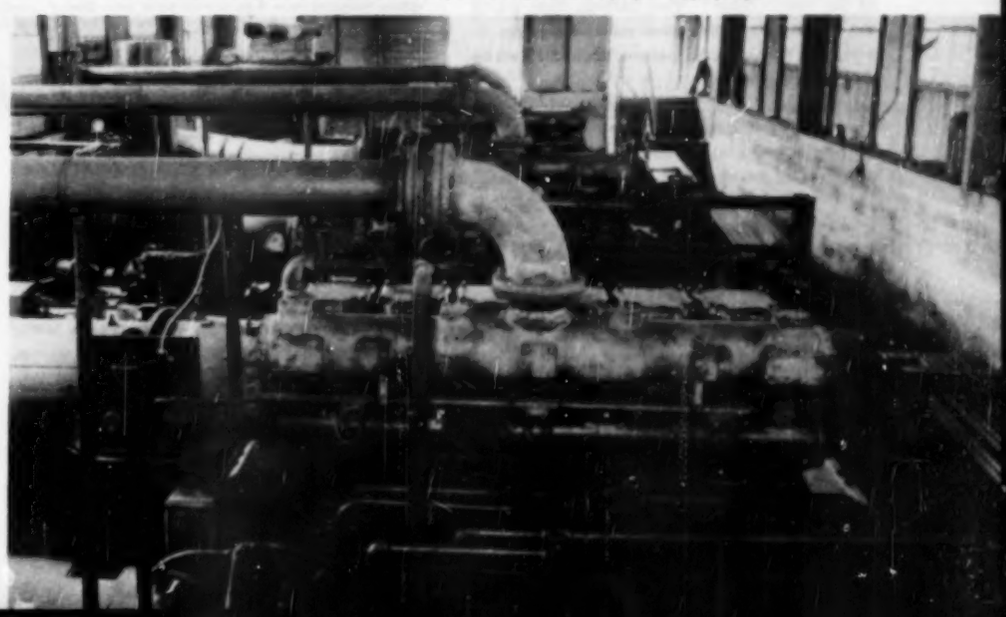
Rain and the river conspired to give the new pumps and engines a thorough test. River men estimated they could expect a 20-ft. head once in a hundred years. Actually they have had heads exceeding 20 ft. three times in the last ten years. In all, the new engine-pump teams have operated a total of 32,209 unit-hours in six years.

The plant is operated by C. A. Jenkins, who also handles maintenance. A relief operator is on call when pumping volume requires two-shift operation. This is a minimum labor force, the same arrangement in effect when pumps were motor-driven. The district is under the management of three commissioners elected by the landowners for three-year terms. Present members of the commission are: J. T. Bozarth, M. L. Houser and I. E. Wilson recently elected.

The diesels have a closed cooling water system, using rain water collected in a cistern. Centrifugal pumps belted to the engines circulate this soft water through the engine jackets and a heat exchanger. Another engine-driven pump picks up raw water from the drainage ditch and puts it through the exchanger. The engines are lubricated with Standard Nonpareil Heavy Duty diesel oil. There are duplex De Luxe lube filters on each engine and a Renuoil using Celite filtration elements for batch purification. A high speed diesel fuel is stored in a 20,000-gal. tank near the plant and flows to the engines by gravity through strainers and Buffalo meters. Exhaust gases from each unit vent through a Burgess snubber outside the plant. A compact panel on each engine holds an Alnor exhaust pyrometer, Reliance tachometer, and U. S. Gauge thermometer. Engines are started by compressed air supplied by a Fairbank-Morse motor-driven air compressor.

Lima Lake Drainage District has achieved notable economies by 1) choosing pumps with excellent efficiency at the prevailing heads; 2) by using diesel engines to provide low-cost power.

General view showing three Fairbanks-Morse engines driving horizontal propellor type pumps.



ENGINES OF MERCY

By **W. J. GRANBERG**

Alaska's sea-going clinic, operated by the Territorial Health Department, is the *Hygiene*, a 114-foot, twin-screw wooden vessel powered with two Diesel engines. Operating out of Juneau, it is shown here in Seattle for overhaul. On the bow deck is Capt. George Kippola, master.

IS there a doctor on the ocean? A native, or lonely trapper, peers through the mist and fog, glimpses the spotless white superstructure of the little ship and down the beach and back into the treeless tundra goes the word that the doctor-ship is coming. Before the vessel is safely anchored off the rocky shore, every resident of the bleak village is on hand to greet her.

Driven by two diesel engines, the MV *Hygiene* pokes her way across the North Pacific, through the Bering Sea, and back into the more quiet waters of southeastern Alaska to bring medical and dental attention to the isolated settlements of the "49th" State." This floating clinic marks the Territory's unique and successful effort to bring the doctor to the patient, no matter where that patient may be.

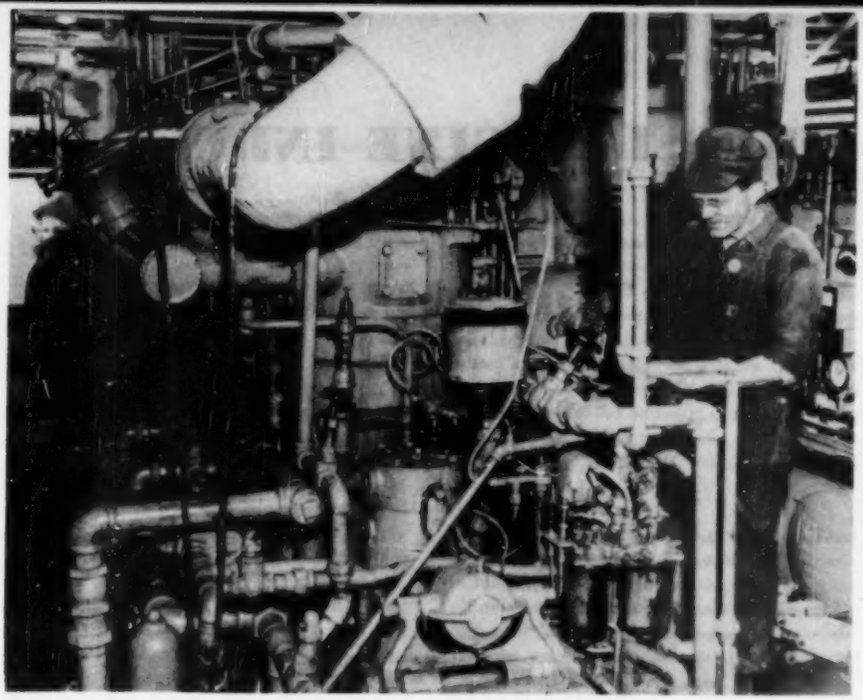
The *Hygiene*, successor to a smaller ship which served for one year, is now in her third season as a floating health center. It is a wooden vessel, 114 feet long and with a beam of 27 feet. It is powered with two diesel engines which drive twin screws and give the ship a speed of 10 knots. The engine room is neat and orderly, just as though the clinical cleanliness of the consultation cabins had been transmitted below decks.

The engines are six cylinders, 11½x15 bore and stroke, developing 320 horsepower each. The fuel carrying capacity is 8,500 gallons and the consumption by both engines at cruising speed is 42 gallons an hour. The electric power plant for ship's use when under way is a five kilowatt direct current generator, 135 volts, driven at 1159 rpm by the port engine.

The greatest demand for electricity comes when the health ship is in port, for it is then that dental and medical offices are open and lighted brightly to serve the visitors from shore. Power comes then from generators driven by two diesel engines, one on each side of the engine room. They are six-cylinder units, 3x4½ bore and stroke, developing 32 horsepower. Each engine uses two gallons of fuel an hour. Both generators are direct current, 20 kilowatt units.

There are two X-ray machines aboard the ship, one in the dental department and the other in the medical room where it is employed, for the most part, in chest work, for the incidence of tuberculosis among native Alaskans is high. The alternating current plant to supply the X-ray machines is situated at the stern on the main deck. It is a diesel generator set. This six-cylinder unit develops 90 horsepower to turn the 60 kilowatt, 110 volt generator. Its fuel consumption amounts to three gallons per hour.

One of the pleasing features about the trim little *Hygiene* is its roomy wheelhouse. Here are the modern aids to navigation which help take the ship through the treacherous waters and rough weather of the Aleutian Island area and the Bering Sea.



The power plant of the floating Alaskan health center consists of two 320-horsepower Atlas Imperial Diesels. They drive the ship at a cruising speed of 10 knots. In the background on the port engine shown above may be seen the electric power generator for ship's service while under way. It is a Westinghouse direct current, 5 kw, 135 volt unit driven at 1150 rpm.

Shown at the controls of one of the Atlas Imperial Diesels which powers the *Hygiene* is A. Gair, chief engineer.

Alternating current for the *Hygiene's* medical and dental X-ray machines is supplied by this General Motors diesel generator set situated on the stern of the main deck. The 90-hp. diesel drives a generator which turns out 60 kw, 110 volts.

The *Hygiene*, skippered by Capt. George Kippola, carries a crew of eight men in addition to the operating manager, Darrel Naish. The chief engineer is A. Gair. The vessel's home port is Juneau, and it is from there every summer that the long voyage to the north and westerly begins. During the 1947 season the ship traveled 6,800 miles from June 10 to December 23, getting back home just in time for Christmas after long months visiting the far-flung settlements and towns who will see no doctor again until the *Hygiene* calls again this year, or maybe not until 1950. During the winter months the health ship calls at towns along the waters of southeastern Alaska.

Kodiak Island, Unalaska, Norton Sound, Good News Bay, Cook Inlet, St. Lawrence Island, Akutan, Unimak, Nome and Sitka—those are just a few of the ports of call for the health ship. The medical staff of six consists of a physician-surgeon, dentist, dental assistant, secretary, nurse, and bacteriologist-X-ray technician. An average of 300 people, half of them children, are examined each month. After tuberculosis, skin diseases rank next in prevalence and these, largely due to uncleanliness, are being eradicated by teaching personal hygiene through the use of motion pictures shown aboard ship and by health lectures. At settlements which boast a resident nurse, and less than half of them do, the health program initiated by the ship's visit is carried out long after its departure.

So successful is the health ship program, the Territorial Health Department is preparing now to fit out a shallow-draft motor barge which will ply such rivers as the Yukon to reach villages inaccessible to the *Hygiene*, and there again diesel "engines of mercy" will bring medical and dental care to the men, women and children who never see a doctor unless they are carried by airplane to a hospital in an emergency.

Equipment

Propulsion engines—Atlas Imperial.
Auxiliaries—General Motors and Hercules.

DIESEL ENGINE INDUSTRY GETS TOP SALES RATING FOR 1950

Peter B. B. Andrews, industrial economic expert

By PETER B. B. ANDREWS

Editor's Note: We hope that every reader of DIESEL PROGRESS will read this outstanding contribution by Mr. Andrews in which he states and then proves that the diesel industry is today a five-star industry, that the prospects for the diesel industry in the immediate future are better than they have been since the end of the war. Mr. Andrews gives facts and figures which are incontrovertible—facts and figures which history will prove accurate to an uncanny degree. Mr. Andrews has an excellent reputation as a prophet.

The engine builders, the accessory equipment builders, the diesel engine salesmen and the accessory engine salesmen who read this article should clip it out and use it in their day by day activities. Some industries may be going through a readjustment period, some industries have already reached their top in production and sales and are on the way down. That is not true of the diesel industry.

We are just beginning to hit our stride and 1950 is going to be tops, and then 1951 is going to beat 1950. Nevertheless, despite the activity that now exists in the diesel industry, the weak and poorly managed companies, both among the engine builders and among the accessory manufacturers, have either cancelled their advertising entirely or materially reduced it. They have reduced their selling forces to a skeleton of what they used to be and these companies are going to pay and pay bitterly for their lack of judgment and lack of alertness. On the other hand, the strong and well managed companies among the diesel engine builders and the accessory manufacturers have stepped up their advertising program appreciably, have in some cases as much as doubled their selling forces and these are the companies and the men who are going to cash in on this five-star diesel industry of ours.

Again we say to you, read this article by Peter B. B. Andrews. It is the most constructive, provocative article we have ever run in DIESEL PROGRESS.

ONE of the most promising lines of business in the United States in 1950 will be the diesel engine industry. This is the consensus of the Board of Judges of Future Sales Ratings, a nationally famous organization which rates the sales prospects of the 100 leading industries of the country. The ratings of the complete list of 100 industries a republished quarterly by *Sales Management*. The currently existing potential of new diesel engine orders is estimated by the writer and his future-sales-ratings associates to approximate $3,500,000,000, more than a decade of capacity operation for this industry.

With intensive advertising and promotion to bring the crystallization of the many modernization and expansion desires into orders, it is possible for the diesel engine industry to reach total sales in 1950 approximating $300,000,000 — a new high record, even with the drawbacks of early steel shortages. This is not to say that any salesman can walk up to a prospect and casually "accept" an order for equipment. Advertising and promotion, to pave the way for salesmanship, are more of a must than ever, as the country and the world cope with the economic problems of a buyer's market in industry.

Necessarily, these figures are estimates, being based on the writer's surveys among Government and trade economists and marketing specialists on the diesel engine industry in the 300-man board which decides Future Sales Ratings. Such comments among Government economists as "the need for production is undoubtedly high," and "production could be much higher than in 1949," referring to diesel engines, keep pointing up the "if" quantity—"if" advertising and promotion are great enough and strong enough. The writer believes that the diesel engine industry will meet these challenges, and that the Board of Judges of Future Sales Ratings is well justified in reaching a rating-consensus of five stars for diesel engines in 1950. That is the highest rating any industry can get, and it signifies an expected outstanding level of activity in the new year.

In talking to these authorities, whether in Government or in private industry, the writer has found extensive use of DIESEL PROGRESS; many were outspoken in their regard of this publication as the statistical and editorial bible of the diesel industry.

The foremost consideration in the Board's high appraisal of the diesel engine sales potential for 1950 is the strong financial condition of general industry, agriculture, and the public, as well as improved business sentiment for 1950. Diesel engine sales are expected to outpace most other industries in 1950, reflecting the increasing fundamental demand for economy and efficient operation in such industries as railroads, trucking, passenger transportation, farming, construction, shipping, petroleum production, logging, road building, basic industrial power, air conditioning, mining,

irrigation, quarrying, and central and municipal power plants.

One of the banner percentage increases will take place in railroads, just as it has in the past several years. Not only is demand continuing to run strongly, but productive capacity is rising. For example, Lima Hamilton Corporation built its first diesel-electric locomotive early in June, 1949, and, of course, the company is continuing to build and ship at present. Dan Ellis, president of Lima-Hamilton Corporation, pointed out to the writer that it would appear that based on their present plans, the railroads' diesel demands should be good for several years, depending, of course, on the volume of traffic and the level it may ultimately reach. In just the first ten months of 1950, the Class I railroads installed 1,577 new locomotives, the largest number of any similar period since 1923. Significant it is that this total included 1,524 diesel (and only 54 steam) engines. In the similar period of 1948, installations were 1,159, of which 1,082 were diesel. As of November 1, last, these roads had 833 locomotives on order, including 812 diesel.

While net income of railroads was off in 1949, they kept ordering diesels heavily, in their objective to operate more economically and cut expenses. With labor costs high, this objective will be an increasing one throughout industry. The engine builders, the accessory equipment builders, the diesel engine salesmen and the accessory engine salesmen can be thankful for the young growth nature of their industry and the expectation that it will make a considerably better showing than industry as a whole. General Motors is constantly expanding its line; the Electro-Motive Division's output capacity has been quadrupled since the end of the war, and recently this division unveiled three new models of diesel railroad switching locomotives and a diesel passenger locomotive, as well as a new type of heavy duty diesel suitable for combination passenger and freight operation.

Coal strikes are likely to give the entire diesel field a further lift, coming, too, at a time when there has been a broad easing of the oil supply. Fast as the growth of the diesel engine industry has been in recent years it was nevertheless somewhat hampered by the heavy demand for oil for other projects. Surplus inventories of oil now give the industry the green light on expansion.

Looking at another important field for diesel engines, the construction situation is extremely important from two standpoints—that of direct demand for diesel engines in its own right and that of its great underlying effect on the basic economy and therefore related demand for diesel engines. The construction situation, happily, is excellent. It, too, just as in the case of diesel engines, has the top, five-star, future-sales rating. This industry will contribute heavily to the diesel engine demand, since it will affect such lines as transportation (construction goods to be moved), mining (ores and metals for building materials), logging, quarrying, shipping, and basic industrial power. It is expected that expenditures for new private residential construction will approximate for the full year 1949 about $6,600,000,000, which would compare with actual expenditures in the full year 1948 of $7,223,000,000. The 1950 total, however, is preliminarily estimated at $7,500,000,000, topping the 1949 total by $900,000,000, and the 1948 total by $277,000,000. Gains in public residential construction are expected to be much greater percentagewise. Expenditures in this field are estimated at approximately half a billion dollars for 1950, which would represent a rise of $300,000,000 over the $200,000,000 estimated as the likely figure for the full year 1949, and a rise of $415,000,000 over the actual figure of $85,000,000 for the full year 1948.

Overall new construction activity also is expected to gain in 1950 over 1949; tentatively, it is estimated that all new construction expenditures, including commercial and residential, may attain $21,000,000,000, a new high figure which would compare with an estimated $19,200,000,000 for the full year 1949 and an actual figure of $18,775,000,000 for the full year 1948.

Similarly, other great industries vital to the country's basic economy and therefore to the diesel engine industry are believed by the writer and his future-sales-ratings associates to face good prospects for 1950. Besides diesel engines, aircrafts, shipping, travel, air conditioning, gasoline and oil, hardware, agricultural machinery, oil burners, plumbing and heating, and trucks and automobiles are among those that enjoy the top, five-year rating among the 100 leading industries of the nation. The effect of another big automobile year in 1950 will of course only be indirect, except for trucks and buses. Intensive use of the road by trucks, buses and passenger cars will grow further in 1950. Motor travel for the full year 1949 probably will be recorded at close to 425 billion vehicle miles, which is 25 billion more than in 1948 and 92 billion more than in 1941. Rising competition, as, for example, railroads versus trucks is certain to mean greater attention to the economical diesel engine. And, obviously, the equipment needs and effect of this great rolling economy on the nation's life is immense.

Huge forthcoming expenditures by the Federal Government and by states and municipalities (largest ever scheduled for peace times) likewise are certain to have a stimulating effect on the diesel engine industry. Government cash outlays totaling $46,000,000,000 ($5,000,000,009 more than in the preceding year) will be the expenditures for the current fiscal year which ends this June 30th. Federal benevolence to the farmer will help to keep that market for diesel engines attractively high. Though it is generally known that farm income in 1949 was below that of 1948, some are less aware of the fact that physical output of farm goods was higher in 1949 than in 1948. The wear and tear on farm equipment, therefore, was greater than in any preceding year, and it is this factor, as well as the strong balance sheet position of American agriculture, that the Board of Judges of Future Sales Ratings considered in the common denominator of a high demand for farm machinery and therefore for the increasingly popular diesel engine.

The preponderance of this Board's judgment is that with the return of normal buyers' markets we may look forward to one of the greatest periods of business development in our history. In the few years that have elapsed since the war, we have made only a limited start toward developing such of the newer products as diesel engines. Our factories had been so occupied with supplying the quickest available goods to fill accumulated demand that the introduction of many new lines had to await a time such as the present.

Replacement of most types of equipment has been at a low rate. Much of the equipment which was already overage at the end of the war is still in service. Relatively inefficient facilities have been continued in operation because they were needed to satisfy the demand for end products and because, given the pressure of that demand, the prices charged could be high enough to cover the cost of operating the inefficient equipment. With the return to more normal competitive conditons, there is again a strong incentive to reduce costs by replacing such equipment. And, most certainly, American industry has the wherewithal for buying. Present liquidity is record-breaking. Current assets of U. S. corporations aggregate about $125,000,000,000, including the huge figure of nearly $50,000,000,000 in cash and Government securities. This figure compares with only about $57,000,000,000 in current liabilities, leaving a record-breaking total of $68,000,000,000 in net working capital!

For those companies whose financial conditions may not be tops, or which have their net working capital tied up in inventories, an important factor mentioned by the Board of Judges of Future Sales Ratings as favoring larger outlays in 1950 is the likely greater ease of financing. In recent years less than 25% of total diesel equipment expenditures came from borrowings, with the remainder coming out of earnings. Plowing back of earnings has been extremely large, and it will continue large, but it will be supplemented by greater ease of financing and more outside financing.

All the foregoing factors, plus the obvious fact of the thorough establishment of the diesel engine in the American industrial and agricultural system, represent the basic line of reasoning by which the Board of Judges of Future Sales Ratings arrived at the conclusion that diesel engine sales prospects merit a five-star rating among the 100 leading industries of the United States. These authorities operate on the basis that we, as businessmen, are naturally more interested in what is going to happen tomorrow than in what happened yesterday. They try as much as possible to avoid planning on the basis of back statistics or current operations, and attempt, instead, to plan on prospects. Considering the tremendous importance of the diesel engine industry in the nation's economy, it is doubly pleasant, then, to record the fact that this majority authoritative estimate says that the future looks good for diesel engine sales.

High-Speed Diesels . . . Design, Operation & Maintenance

CONDUCTED BY H. G. SMITH

Combustion Chambers

SOME users of high speed diesel engines may be interested in the above subject because combustion chambers are the basic reason why we have several different types of engines on the market today. These engines do have some basic differences, as can be readily seen by just looking at them from the outside. Sometimes fleet owners have two and three different makes of engines in their fleet and have successful operation from all of them. A little closer inspection will show that they have different fuel injection pumps and injectors. The location of the injectors are in one place on one engine and another will have an entirely different spot in the cylinder head.

With these major differences the question is sometimes asked: "How can each one be so successful and still be so different?" The answer can be summed up in two words, "Combustion Chamber."

Each engine manufacturer is doing the same thing but in a different way. The object of each type is to cause the air and fuel to thoroughly mix so that the fuel will be burned completely, or as completely as possible. Each designer has found, by study and laboratory work, a particular way of doing this mixing and burning. In his research he has determined that by injecting the fuel in a certain manner he obtained the results he wanted.

Studying all the high speed diesel engines described and listed in the Diesel Engine Catalog (issued yearly by DIESEL PROGRESS), they can be classified into three distinct types of combustion chambers. These are (1) Direct Injection or open type; (2) Precombustion, and (3) Energy or Air Cell arrangement. There are several different variations, but basically they come under one or the other. Referring to the illustrations, they can be described as:

Figure 1 is the Direct Injection design. The fuel is injected directly into the open combustion chamber, and the injector is usually placed directly over the center of the piston. The small holes in the injector spray the atomized fuel to all parts of the chamber.

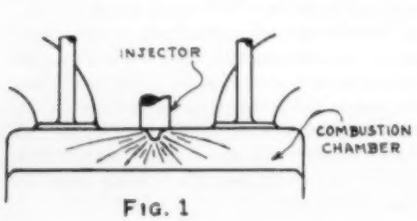


FIG. 1

Figure 2 is the Precombustion type. A small chamber is off to one side or above the main chamber, and the injector delivers the fuel spray into this separate chamber where the fuel is further broken up before entering the main chamber.

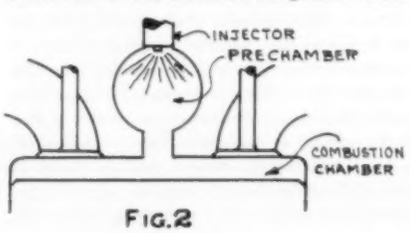


FIG. 2

Figure 3 is the Energy Cell type. It is somewhat similar to the precombustion type except that the injector is placed in the main combustion chamber in such a position where it can spray the fuel into this separate cell. The illustrations, for clarity, show only the simple outline of each type. Each designer has incorporated many refinements and their own particular variation to these basic designs resulting in their own distinctive interpretation of what is needed to be successful. To decide which design is the best would be quite difficult because each one is used successfully and gives approximately the same performance. The main object of each design is to get maximum mixing of the fuel and air by having maximum turbulence.

Turbulence is the same thing that occurs in a cyclone, a lot of air moving and stirring around in the combustion chamber. In doing so, it picks up the fuel spray and makes it contact as much oxygen in the air as possible which will cause the fuel to burn. The fuel injectors are located at different angles and in various positions, always trying to get the fuel into and in contact with the air when it is moving the fastest.

Research, in time, may prove that there is an ideal arrangement, but until that time comes we must be satisfied that there are several equally good arrangements. Today each manufacturer is convinced that he has the best arrangement. There never was such a period of two or three basic arrangements for the gasoline engine. True, it is, the gasoline engine combustion chamber has gone through a long period of refinement, but this has been primarily due to the change to higher octane fuels. This same change may happen in the diesel engine if a new fuel is developed that would burn a little easier. When that happens, however, we may lose some of our advantages that we have today, such as a low price fuel.

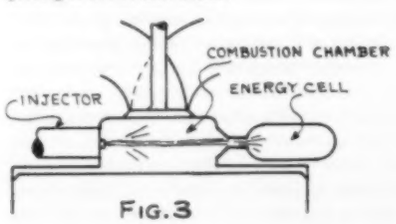


FIG. 3

The location of the fuel injection pump is usually determined by the location of the fuel injector, so the pump on one engine may be on one side while another will have it on the opposite. Some engineers have combined the pump with the injector; others like the high pressure pumps and some the low pressure type. Regardless of the type used, the main object is to deliver the fuel to the combustion chamber in a definite time and measured quantity.

Each type of combustion chamber likes a particular type of fuel delivery. The energy cell type wants a short and fat delivery. The precombustion arrangement is just the opposite, a longer and slenderer delivery is desirable. The open type or direct injection arrangement prefers a high pressure finely atomized spray. These are some of the reasons why you cannot transfer one type of injection pump from one engine design to another. Even in cases where some different make engines use a pump that from all external appearances, it is the same; still, the fittings inside are entirely different.

This article cannot cover or discuss all the different angles to this combustion chamber subject, but these few remarks may clear up a few points that have come up. The designers and engineers of diesel engines have spent a good many years studying this burning of fuel and are continually getting it better and better.

Purolator to Move to New Plant Site

Plans to consolidate the expanding operations of Purolator Products, Inc., manufacturer of automotive oil filters and other types of filtration equipment, in a larger, single-unit plant at Rahway, N. J., were announced by Ralph R. Layte, president of the company. The new Purolator plant, largely a one-level steel and concrete structure, will provide nearly 300,000 square feet of modern production and office space. Subject to certain requirements, it is expected that the plant will be taken over by Purolator in late 1949. So far as practicable, Purolator plans to transfer its present employees, totaling around 1,100, to the new Rahway plant and general offices and are giving up our valuable industrial space in Newark only because the growth of the business makes it necessary.

The new site is on the main line of the Pennsylvania Railroad, about 20 minutes out of Newark, providing an unusually attractive site for Purolator's type of operation, both from the standpoint of proximity to markets and raw materials, and from the standpoint of excellent working conditions for employees. Purolator tentatively estimates total 1949 sales will be around $12,000,000, a record peace-time year. Under its new advertising and sales promotion policy, the outlook very definitely is one of further growth in the years ahead.

Grinding Service for Diesel Crankshafts

The National Welding and Grinding Company of Dallas, Texas, has a giant 80,000-pound grinding machine that was designed and constructed right in the shop. They started with a Norton plain roll grinder of 24-inch swing and 20 feet between centers. It was modified to become a double end drive and to swing 42 inches by 200 inches between centers using a 48-inch grinding wheel.

Primarily designed for grinding crankshafts from diesel locomotives, large oilwell drilling rigs, tug boats and stationary engines, this equipment can be used for most any big grinding job. It will accommodate shafts from engines of 15½-inch stroke and not over 16½ feet over all length.

Shown in the photograph is a job done recently for a Dallas paper mill by National Welding and Grinding Company. This solid roll, weighing over 5,000 pounds and measuring 12 inches in diameter, was ground to a tolerance of .001 of an inch over its 14-foot length.

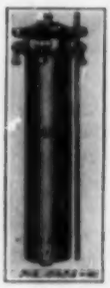
It's Nugent!

for Fuel and Lubricating Oil

FILTERS

The widespread use of NUGENT Absorbent Type Fuel and Lubricating Oil Filters is indicative of how industry is helping to conserve lubricating and fuel oils.
Figs. 1280 A 4L and 1280 AU 4L4, show two sizes of THE IMPROVED NUGENT DEPTH TYPE PRESSURE FILTER. These types are equipped with 1 to 12 standard filter cartridges in a single container or shell of various sizes, depending upon the filtering capacity required. All cartridges are alike and interchangeable regardless of whether they are the Repackable type or the Replaceable ("THROWAY") type. Both types are made for capacities from 1 to 2248 H.P. in single containers or shells. (Navy specifications.)
This largest size contains only 12 recharges and filters a total of 182½ GPM lubricating oil. Compare this with other makes of filters containing 35 to 40 small recharges that must be stocked and handled each time you clean the filter.
NUGENT Fuel Oil Filters are made for Diesel engines from 1 to 384,000 H.P. in single containers.

(Above) Replaceable "THROWAY" type recharge.



(Above) A Nugent Filter shell containing one cartridge.

(Above) Arrangement of 4 cartridges in 1 shell. Larger size shells are made to contain 5 to 12 cartridges.

NOTE THESE SUPERIOR NUGENT FEATURES:

- Easy and neat piping because inlet and outlet openings are opposite, close to the bottom.
- Filters have built-in by-passes—will take full flow or by-pass filtering.
- Drain plugs. Air vented.
- Reduces the neutralization number of lubricating oil from 0.40 to 0.04.
- Very inexpensive "THROWAY" Replaceable cartridges.
- Absorbs moisture four times its own weight.
- Traps abrasives such as gritty carbon, dust or metal particles.
- Safety: Patented construction prevents rupture and by-passing: all materials in elements harmless to engine: leaves the additives unchanged in modern compounded lubricating oil.
- Free flow: Entire outside surface filters oil. The patented center strainer core maintains free flow of the filtered oil and will not collapse nor by-pass under extreme pressure.
- Efficiency: Minute openings narrow toward the center: stop large particles first, small ones later, distributing dirt evenly through the elements.
- Longer life because of larger filtering area.

Wm. W. Nugent & Co., Inc.
415 N. Hermitage Ave. CHICAGO 22, ILLINOIS

Established 1897

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Exchange Your Diesel Maintenance Ideas

CONDUCTED BY R. L. GREGORY

LUBE OIL HANDLING AND MAINTENANCE OF FILTERED EQUIPMENT

ONE of the factors conducive to good engine performance is the proper handling of lube oil and lube oil equipment. Most engines of present day make are equipped with some make of continuous filtering equipment and there are several good ones on the market today. However, the mere installation of such a piece of equipment on a unit does not mean that a cure-all for lubricant troubles is at hand.

In order that lubricants can be kept in the best possible condition both oil and equipment must have periodical checkups. Every engine manufacturer has his list of approved lubricants for his make of unit. He does not consider it necessary to pick any particular one of these lubricants and say: "Now if you will use such and such a brand, you will have the best lubricant available for this engine." But he furnishes you with an approved list, and you can take your choice.

The result is that most of us try them out and when we find the oil which gives us the best lubricating results we more or less stick by it unless some particular incident occurs which disrupts our otherwise satisfactory operating condition, then we try some other approved brand. Now some person is going to ask: "Don't you ever take price into consideration when purchasing lubricants?" My answer would be to that question, that price is given consideration, but the cheapest oil you can buy is the one that gives you the most satisfactory results over a period of time, and the one which keeps its condition and characteristic lubricating qualities with a minimum of treatment and handling, regardless of cost, if said cost is not out of line to any extent.

However, once you have adopted a certain brand and grade of oil for your units, it is then up to you to see that the oil retains the qualities necessary for good operation. That depends on periodical check-ups not only of the lubricant itself, but also of your filtering equipment. The purpose of filtering equipment is primarily to filter out foreign particles, moisture and other agents which instead of helping lubrication, are detrimental to the process of lubricating.

As previously stated, there are several good filters on the market today, but don't be mislead by the fact that once one of these filters is installed, that ends any further trouble with your lubricant. Most of the standard filters use a filtering agent such as hilite, cranite or some similar agent for removing these foreign particles. They are further constructed with some type of heating elements, thermostatically controlled to keep the oil at proper temperature when passing through the filter.

Now what is the action of these filters while in operation? Most of them are constructed for continuous operation, thus filtering the lube oil several times during a 24-hour period of engine operation. The oil in continuous passaging through the filter is purified by the filtering agent picking up the foreign matter, such as carbon, moisture, etc., from the oil, thus rerunning clean lubricant to the engine. The amount of foreign matter picked up depends on several conditions, such as the type of fuel oil used, the status of combustion, the mechanical condition of the unit itself as to leaks, etc. A unit operating on a poor grade of fuel with faulty combustion or leaky joints with regard to the engine cooling agent, etc., will accumulate more foreign matter in the lubricant than will an engine using good fuel, with proper combustion and in good mechanical condition.

The filtering agent within the filter picks up these foreign particles and after a period of time becomes more or less saturated and its function as a filter depreciates in proportion to the amount of foreign material thus accumulated. Then it is up to the maintenance crew to change the filtering agent and clean out the filter, at the same time inspecting the heating elements and thermostatic controls to ascertain whether these parts are functioning properly.

Someone will ask: "Just what do you call a proper elapsing period for such inspection?" That depends upon several conditions such as the type of filter used, the lubricant being filtered, the condition of the unit as to combustion and operation and the number of hours of service on the unit.

Most of these standard types of filters are equipped with temperature and pressure gauges. The standard practice is to pass lube oil through these filters at anywhere from 130 to 160 degrees F., but this varies with the size of filter, type and amount of lubricant to be filtered. Pressures of the oil passing through the filter vary from 35 to 60 psi, and should there be a sudden advance of pressure beyond the point that is recommended, it is usually a sign that the filtering agent is becoming saturated and the filter is no longer doing its job. If the oil temperature drops to any appreciable extent and the indicator lamp shows that the thermostat is continually calling for heat, it is an indication that one of the bands or heating elements is at fault.

In keeping your lubricant in proper condition along wtih your filter, the following suggestions are made, presupposing that an engine operates the major portion of a 24-hour period, from six to seven days a week.

1. Weekly samples of the lubricant oil in the crankcase should be taken and compared with a sample of new lubricant as to texture, color, etc. When much of any varition is found, further investigation should be made.

2. On an engine operating as above, it is good policy to change the crankcase oil about every four to six months on general principles. The dirty oil drawn off should be filtered with a batch filter, using enough filtering agent to restore the normal color and texture, there being laboratory equipment on the market available for such checkups, this filtered oil to be stored in clean tanks or barrels for further use.

3. When changing crankcase lubricant where a continuous filter is used, it is well to change the charge in the filter along with the crankcase lubricant, also to clean and inspect the filter before again putting it in operation. Thus you have a clean start not only with the lubricant but also with the filter.

4. If time permits, it is suggested that the inspection or crankcase doors be removed and the side walls and crankcase be cleaned while the crankcase is drained. There is always a certain amount of carbon and foreign material lodging on parts of the frame and along the inner sides of the crankcase. With these removed, they will not be flushed down into the crankcase in future operation and thus pass on into the filter itself.

5. Now in drawing off the old crankcase oil, arrangements should be made to drain the whole system when removing the lubricant. In most unit installations the low point of the system is either in the heat exchanger or the auxiliary pump. Many maintenance men use the auxiliary pump in draining the system. This can be done if care is used in operating it. On the other hand, unless this is done under constant watchfulness there is a possibility in damaging the pump, especially if it is a geared or bucket type unit which may be allowed to operate after the lubricant is removed.

6. The quickest and surest way to empty a system is to have a separate portable unit which can be moved from unit to unit, this unit to be equipped with a portable suction and discharge hose. The suction hose being connected to an outlet in the lowest point of the system and the discharge hose going to the dirty oil tank, where the oil to be filtered by the batch filter is stored. This type of equipment is more or less inexpensive and a lot of time and labor can be saved in draining lubricant systems when necessary.

Much more could be said relative to care and maintenance of filtering equipment and oil reconditioning, but space will not permit further discussion. One thing we do practice in our plant is that of adding a few barrels of fresh oil to batches of filtered oil after they have been used and refiltered a few times. The purpose of this is to freshen or sweeten up the filtered oil. Along with this we send in samples at periodical intervals to the vendor's laboratory in order to have a double check on our lubricants. This enhances our chances of keeping our oil in condition.

Distributor for Detroit Diesel

Appointment of the Colorado Builders' Supply Company of Casper, Wyoming, as distributors of General Motors Series 71 industrial and oil field diesel engines has been announced by V. C. Genn, general sales manager of Detroit Diesel Engine Division. The territory Colorado Builders' Supply Company will cover from Casper includes all of Wyoming except Teton, Lincoln and Uinta counties. Colorado Builders' Supply Company is equipped to handle all G. M. diesel service and parts work in a well-equipped shop with experienced personnel. This company is no stranger to the General Motors diesel engine, as they have been distributors for the Detroit Diesel Engine Division out of their headquarters in Denver since 1947.

Appointments at Baldwin

The Baldwin Locomotive Works has announced that Dana R. Staples has been appointed manager of the newly consolidated Locomotive Engineering Department covering diesel-electric, steam, turbine and electric locomotives. Other appointments in the Locomotive Engineering Department were announced as follows: Ralph Schmidt, Manager, Mechanical Section; Ralph A. Miller, Manager, Electrical Section; John T. Shatagin, Manager, Development Section; Warren B. Darlington, Supervisor of the Drawing Office.

Modernization on Great Northern

Complete modernization of Great Northern's passenger services between Chicago and the Pacific Northwest and entire dieselization of the railway's territory west and south of Havre, Mont., by the end of 1951, were projected today by F. J. Gavin, president of the company.

Announcement of Great Northern's plans for wider use of diesel locomotives and streamlining of transcontinental trains followed placement by the railway of orders for additional passenger equipment to cost nearly 9 million dollars.

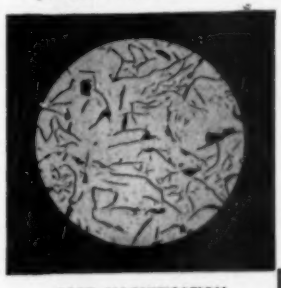
Now one of the country's principal users of diesel-electric locomotives, Great Northern has in service 175 of this type. Mr. Gavin said that the railway has on order an additional 87 diesel-electric passenger, freight and switch engines. "By January 1, 1952, we expect to have 262 diesel-electric locomotives in service throughout the system," said the Great Northern president. "By that date the railway's territory west and south of Havre, Mont., will be completely dieselized, except for the 73-mile electrified segment of the main line through the Cascade mountains in Washington."

Diesel Engine Catalog is just off the press in its Fourteenth Edition. See the unique Diesel Horsepower Range Chart — invaluable aid to design engineers and buyers.

Announcing an Important NEW DEVELOPMENT

4 CONTROLLED "TYPE A" GRAPHITE SLEEVE IRONS

1000X MAGNIFICATION
Note the Type A graphite pattern and completely pearlitic matrix.



100X MAGNIFICATION
Type A graphite extends throughout entire wearing structure of iron.

Centrifugally cast from electric furnace metals in permanent molds — either alloyed or unalloyed.

These 4 new sleeve irons may be specified either as cast or annealed — suitable for hardening up to 600 Brinell. Hardness can be controlled between 200-300 Brinell as cast.

What it means to YOUR PRODUCTION COSTS

Lower original cost than any other comparable castings. Lower scrap loss (less than 2%). Finishing operations reduced because less stock to be removed (1/16") and castings dimensions held to closer tolerances. For equal hardness, there is better machinability. Castings sold rough machined or as rough castings.

What it means to ENGINE PERFORMANCE

In addition to other advantages of Centrifugal castings, these 4 irons, according to some authorities, will give greater wear and better dry lubrication due to the *controlled* "Type A" graphite pattern.

Centralloy

CENTRIFUGAL FOUNDRY CO.
MUSKEGON, MICHIGAN
Centrifugally cast alloyed alloys - exclusively heat-treated for Super Duty

New Six-Cylinder High Speed Cummins Diesels

Two new six-cylinder, high speed diesel engine models designed for on-highway and off-highway automotive applications have been placed in production by the Cummins Engine Company, Inc., Columbus, Ind. Both models have a maximum rating of 175 hp. at 2,000 rpm. They are specifically designed for use on automotive applications where there is a need for the flexibility of higher rotative speeds and the performance of higher horsepower. Features of the two new engines are:

(1) Fully counterbalanced crankshaft.
(2) Camshaft of new design.
(3) Viscous-type torsional vibration damper.
(4) Revised fuel pump.

Both Cummins diesels have a piston displacement of 743 cubic inches, a 5⅛-inch bore, and 6-inch stroke. These two models are supplied with the following standard equipment: air cleaner, oil-bath type (unmounted); electrical equipment—12/24-volt, 700-watt; flywheel housing, SAE No. 2 with SAE No. 3 arms; exclusive Cummins fuel pump; fuel oil filter; fuel oil pressure gauge (unmounted); governor; lubricating oil pressure gauge (unmounted); lubricating oil strainer, full-flow type; thermostats, with main and by-pass flow control.

EMERGENCY POWER....
PROTECTS this BOAT!
The INSTANT the ship's power fails—SYNCHRO-START Controls AUTOMATICALLY start the stand-by engine generator set, and if desired, will provide necessary emergency illumination from the engine's battery until the voltage is up to normal.
SYNCHRO-START Automatic Controls are constantly protecting lives and property all over the world—on the seas, in the air, on land or in the mines.
The vital function of any engine, to supply a continuous flow of power, depends upon a reliable Automatic Control.
If you are not acquainted with the SAFETY and the ECONOMY provided by SYNCHRO-START Controls, ask your engine manufacturer—engine dealer—engineering firm—architect or write for our catalog.
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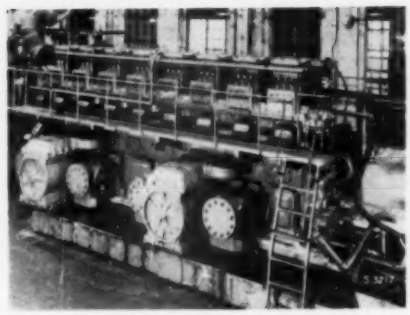
1046 WEST FULLERTON AVENUE, CHICAGO 14, ILLINOIS

New Worthington Uniflo Gas Engine Compressor



Worthington Pump and Machinery Corporation conducted the initial shop test of its new Uniflo gas engine gas compressor at Buffalo Works. Keen interest was shown by technical officials and engineers of many of the country's largest gas transmission companies who witnessed the test, in the remarkable performance of this revolutionary design of gas engine.

The pipe line officials who visited Worthington's Buffalo Works saw, for the first time, the advantages of the Uniflo scavenging principle gas engine compressors. Air inlet ports around the entire circumference at the bottom of the cylinder and dual, mechanically operated exhaust valves at the head were demonstrated to produce perfect clearance of burnt gases from the cylinder; complete charging with clean air; extremely low exhaust temperatures and assured load carrying ability. Particular note was taken of the characteristic of the unit to operate with entire satisfaction at reduced speeds and loads.

The first unit will be permanently installed at the West Monroe, Louisiana, station of the Tennessee Gas Transmission Company on that company's gas pipe line from the Rio Grande Valley to the Niagara Frontier. It will soon take its place there among many other Worthington units in performing its continuous task of pumping our nation's gas fuel from the well to the consumer.

New Bulletins on Nordberg Diesel

Nordberg Manufacturing Company announces publication of four new bulletins on its new one-cylinder 4½-inch by 5¼-inch diesel engine. These bulletins, Nos. 166, 167, 167-A and 168, give specifications, detailed information and outline drawings of Nordberg Model 4FS-1 diesel engines as adapted to power take-off with and without clutch (167 and 167-A), generating units (166) and pumping units (168).

These four-cycle ,one-cylinder Nordberg diesel engine sare rated at 15 hp. at 1,800 rpm. and 10 hp. at 1,200 rpm. The units are compact, rugged power packages built to provide a dependable source of power over a wide range of applications. They are supplied completely equipped and ready for economical operation and long trouble-free service. The units are available for hand and electric starting. Bulletins 166, 167, 167-A and 168 are available free upon request.

Supervising & Operating Engineers Section

CONDUCTED BY R. L. GREGORY

CRANKCASE EXPLOSIONS

PART II

IN last month's issue, the writer took up the above subject and discussed at some length the causes of crankcase explosions. In this issue he will endeavor to give our readers his personal opinion on how to prevent them and tell of what the manufacturers are endeavoring to do to prevent them.

In the writer's opinion, one of the best aids in preventing crankcase explosions goes back to the old theory of preventive maintenance, catch the trouble before it catches you. Good preventive maintenance depends entirely upon periodical and thorough inspections of all parts of the unit, to ascertain that each integral part is in as perfect working condition as it is humanly possible to make it. Since the primary cause of crankcase explosions is the coming in contact of excessive heat with gaseous vapors within the confines of the crankcase, the elimination of this possibility is the elimination of a cause, and the way to eliminate this cause is by keeping your unit in good mechanical condition through proper inspections.

I fear that too many supervisors and maintenance men are prone to recognize the real importance of this point. They want to keep maintenance costs at a minimum, an object which is most laudable if you do not overdo it. But one important point should be kept in mind at all times, that being, that mechanical parts in the routine of daily operation, reach a point of maximum efficiency in operation and from then on start to go down hill, thus inviting trouble and further maintenance. To make the point clear just let me cite a couple of examples.

A few weeks ago I happened into a plant where the maintenance crew was making a major overhaul of a large unit. In walking around the unit I noted that the pistons had all been cleaned and polished, and piston rings in the grooves ready for reinstallation. From casual appearance everything was in apple pie order. But closer observance of the piston rings showed me that they were used rings which had been cleaned up and replaced in the piston head grooves.

So I walked over and asked the maintenance boss just how long those rings had been in service, and he replied about ten months with practically continuous operation. I asked him if he had noted that several of the rings were rather thin on the ends and that most of them had lost considerable of their tensile strength. He replied that he had, and had called the boss's attention to the fact and that he had recommended the installation of all new rings. However, the boss felt that he could possibly get two or three months' more wear out of the rings and that it would be a waste of money to discard them at that time, therefore they were being replaced after cleaning.

In the writers' personal opinion, they were making a mistake right there. They had gone to the expense of a major overhaul and were discounting their success by reinstalling used rings which had outlived their efficient usefulness. They were taking chances and courting possible trouble and further maintenance, which the installation of new rings might avert. Later on I had a point which he had inadvertently overlooked. He ordered new rings installed and put the old ones aside for emergency use, should he get caught short on his ring supply.

Now the second case does not involve a diesel unit but brings out the same point. In this case the prime mover was a steam turbine which was being overhauled and cleaned up. While the unit was down both spindle and cylinder blading was thoroughly inspected. This inspection proved that the first fourteen rows of high pressure blading on both spindle and cylinder were water-cut and that a couple of rows of low pressure blading were also in bad condition. Along with this condition on the high pressure blading, considerable of the shroud rings were in bad condition. Since such blading is not immediately available and has to be made up especially for the job, it was impossible to replace it at the moment. However, the inspection had shown this condition and an order placed for new blading, in order to have it on hand. This condition lowered the efficiency of the unit but the operators and maintenance crew are aware of a condition that should be corrected at the earliest moment and the point to be brought out is the value of preventive periodical maintenance on the units.

Another important item is the proper handling of the unit, should a hot spot occur. Do not rush to open inspection plates or remove the doors and thus allow air to enter the crankcase after a hot spot develops. If you do, nine chances out of ten you are in for trouble. The best procedure to follow is to get the unit out of service as soon as possible, put the motor driven barring gear into operation and keep the engine slowly turning over, working the lubricators by hand to supply oil, then wait at least fifteen minutes, cooling the unit down during this period, and longer if possible. The hot spot will in all probability cool off in much less time, but the longer the time before removing a cover, the greater factor of safety is assured in this operation.

In the past, manufacturers have seemed reticent to discuss crankcase explosions or do much about them, but during the war, the Navy department insisted and got what is known as the "Navy type explosion cover" installed on doors of their units. Such a type of door is shown in the unit in Figure 1. It consists of a circular plate, seated on a round rubber gasket, and held in place with spring tension on a mounting from within. This tension is adjustable by use of a nut to either release or compress the spring. When an explosion occurs, the first usually being minor, these doors open, thus releasing the explosive jar. The tension on this spring wants to be just enough to hold the plate in place, and is usually set around 1½ to 2 lbs. at maximum. The one bad feature of such a valve is that if the explosion is too violent and the door opens too far, before it closes, additional air may be admitted which might cause further damage in the engine.

Other manufacturers have gone to a different type of explosion door, using extremely light strip valves which react instantaneously without the slower reaction of the heavier valve, thus preventing an inrush of air. Most all of these larger types of diesels are now being equipped with this type of explosion door, the type of doors varying with the manufacturer's design, and in all probability the future will show increased development in equipment to prevent these explosions.

For the time being, however, even with these explosion doors, much depends upon plant personnel and their vigilance in keeping their engines in good mechanical condition and watching operating and maintenance practice. Manufacturers can design and redesign, but they must have the cooperation of plant personnel.

New De Laval Catalog

The De Laval Steam Turbine Company has available its new "LG" catalog on the IMO pumps. This catalog shows cut-away drawings of the six different types of De Laval IMO pumps, along with a brief description of each. The IMO pump is designed to handle residual and distillate fuel oils, crude oils, all grades of lubricating oils, hydraulic oils, viscous fluids and liquids of similar characteritsics. It is particularly well suited to oil burner, pressure lubrication and hydraulic pressure services. Capacities range from 0.5 to 1,000 gpm. for pressures to 500 psi. and capacities to 150 gpm. for pressures to 1,500 psi.

Vice President for Blackmer Pump Co.

S. C. May

Stephen C. May has been named vice president and general sales manager of Blackmer Pump Company, Michigan, according to B. L. Gordon, president.

Mr. May has had extensive contact with petroleum producing and marketing, chemical processing, general industrial and jobbing applications of hydraulic equipment.

A program of expansion of the Blackmer Pump line of hand and power rotary pumps includes establishment of distribution channels for new items such as railroad, barge and marine pumps, dual "split-load" truck pumps, and dry cleaners' pumps to be announced soon. A new bulletin 307, "Facts About Rotary Pumps," is available on request from Blackmer Pump Company, Grand Rapids, Mich.

Lanova President Appoints Executive Assistant

Richard C. Woodbury

Frank H. Woodman, President of Lanova Corporation, has announced the appointment, effective Nov. 15, 1949, of Richard S. Woodbury as his Executive Assistant. Woodbury, familiarly known as "Dick" to his many friends in the diesel industry, comes to Lanova from American-Bosch Corporation, where he was Assistant to the Vice-President in charge of sales. In his former capacity at American-Bosch, Woodbury supervised export and advertising matters and acted as liaison contact with trade organizations and technical societies, and became closely associated with the diesel field.

Having graduated from the Harvard University Graduate School of Law, Woodbury holds A.B. and LL.B. degrees and practiced law for some ten years, working into corporate organizations, business finance and business-government relations. Woodbury is an Associate Member of SAE and has served as a member of the Executive Committee of the Southern New England Section of that Society. He is also a member of the American Ordnance Association and formerly a member of the Washington Representatives' Club of the Navy Industrial Association. A member of the Massachusetts Bar and Sigma Nu Fraternity, Woodbury continues to make his home in Long Meadow, Massachusetts.

New Single Screw Diesel Towboat

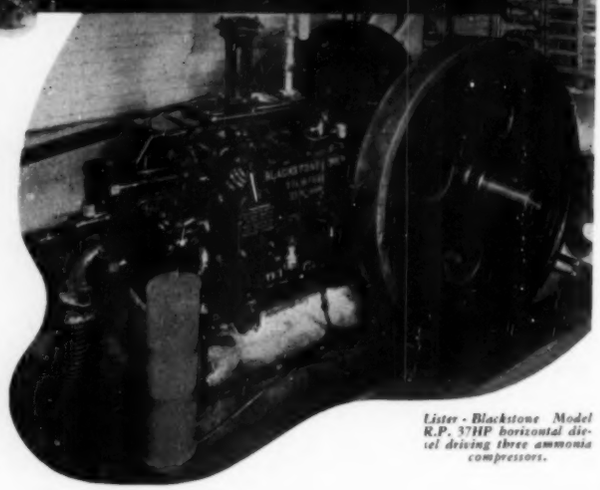
St. Louis Shipbuilding Steel Company has announced that they have received an order from the Bull Towing Company of Joliet, Illinois, for a 400-hp. single screw diesel towboat. The boat will be 68 feet by 19 feet by 8 feet, with a draft of 5 feet 6 inches.

The towboat will be used in the Chicago harbor and the pilot house is mounted on a hydraulic ramp so that it can be lowered to pass under the bridges. This new towboat, to be named the *Ferdinand*, is the first river boat to use one of the new Model 1 D 397 Caterpillar diesel engines. This engine is rated 400 hp. at 1200 rpm. and is fitted with a Falk reverse reduction gear.

"In eleven years this engine has paid for itself several times over."

— James M. Bard, President
Mount Pleasant Ice Cream Company, Inc.
Thornwood, N. Y.

"We cannot praise our engine too highly, for it has done a fine job for us."



Lister-Blackstone Model R.P. 37HP horizontal diesel driving three ammonia compressors.

HERE ARE ADDITIONAL SALIENT FACTS quoted in part from a letter received from Mr. Bard praising the sensational 11-year performance of his Lister-Blackstone Diesel:

- The 11-year averages of daily fuel and lubricating oil cost approximates *but $2.00 per 12-hour day*, running constant load.
- There is little difference between present economical fuel consumption of this 11-year-old engine compared to the time when it was new.
- Repairs, including a ring job, have not totaled over $125.

"We would not be without one of your engines."

—P.S. Mr. Bard has just ordered an additional Lister-Blackstone Diesel!

NEW REDUCED PRICES

on dependable, low-performance-cost Lister-Blackstones give you biggest diesel value for your dollar. 3 to 300 H.P. Write for price list, stating your requirements. Address Dept. DP.

Lister-Blackstone
'THE DIESELS THAT ENDURE'

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Agents in
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MOBILE . TAMPA . MIAMI . NEWTON (Iowa)
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VANCOUVER . ST. JOHNS . EDMONTON
Sold and Serviced in 37 Countries Throughout the World

Get your 1949, Fourteenth Edition of Diesel Engine Catalog now. Just off the press and entirely re-written as well as brought up-to-the-minute, it is a MUST for all connected with the diesel industry. ORDER TODAY.

Graphite Wheel Flange Lubricating Rods

National Carbon Co., Inc., announces its "National AWE" Grade graphite wheel flange lubricating rods for reducing the flange wear of diesel-electric and steam locomotive drive wheels. Two sizes, ¾ in. dia. by 12 in. long, and 1 in. dia. by 12 in. long, have been developed at the request of the railroads. The ¾ in. dia. is the more popular of the two and is considered the standard size. These rods can be used in several makes of rod holders now in service as well as in simple holders, of the general type illustrated, which can be readily fabricated in railroad shops.

"National" Grade "AWE" graphite rods deposit an adhering film of graphite at the point of high friction and wear at that point only. The grade of material has been selected to eliminate many of the problems of existing flange lubricating equipment. While increased life due to "AWE" lubricating rods will vary according to local conditions, in commercial application they have increased mileage per flange 100 per cent over unlubricated equipment, giving a net savings of about 30 per cent in wheel maintenance.

New Sales Representative

King D. Boyd

A strong interest in the oil industry and a love for his native state of Texas has made King D. Boyd the newest sales representative for Stewart & Stevenson Services of 4516 Harrisburg Blvd. — the firm which has been supplying the petroleum industry, among others, with GM Diesel engines for many years. Mr. Boyd's friends in the industry will remember back before World War II when he was district sales engineer for the Reed Roller Bit Company in Southern Oklahoma and North Texas territories. They will also recall his more recent association with Detroit Diesel, where he amassed much of his diesel engine and sales experience.

New Catalog by National Bearing

A new catalog, "Bronze and Copper Bearings and Castings," has been released by National Bearing Division of American Brake Shoe Company. Illustrated with pictures and charts, this 28-page booklet gives physical properties and comparative specifications for 27 different bronze alloys and 5 aluminum and manganese bronzes. Sizes and weights of rough and machined "Tiger" Bronze bars are tabulated. Babbitt metals, their descriptions and uses, are also discussed and illustrated, and their various physical properties have been charted.

This booklet describes the complete manufacturing facilities—from engineering conception to finished product—which National Bearing now has available for the manufacture of non-ferrous bearings and castings. Prominent space is devoted to illustrations of bearings and castings as made in the division's plant. Copies of the catalog are now available and will be mailed upon request.

New Sales Division for Mack

D. C. Wheeler

Creation of a new Mack Company territorial sales unit, to be known as the Southwestern Division, with headquarters in Dallas, Texas, is announced by A. C. Fetzer, vice president. Included in this realignment of Mack sales territory are the company's already established Dallas, Houston, Oklahoma City and New Orleans offices, most of the state of Texas, and all of New Mexico, Oklahoma, Arkansas, Louisiana, Mississippi and the Republic of Mexico.

Heading Mack's new sales division is D. C. Wheeler, recently elected vice president of the company. Since 1942, when he became manager of Mack's Dallas branch office, Mr. Wheeler has been in charge of the company's sales and service of trucks, buses and fire apparatus for part of Texas, New Mexico and the Republic of Mexico.

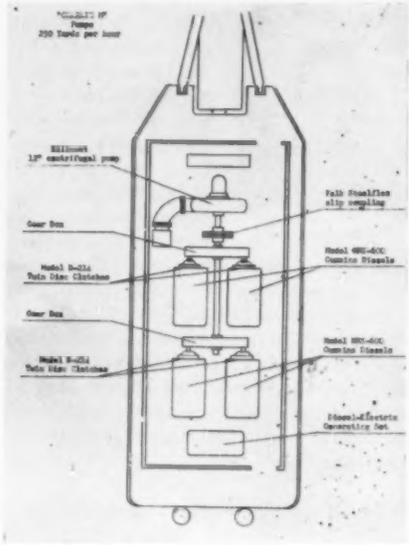
Get your 1949, Fourteenth Edition of Diesel Engine Catalog now. Just off the press and entirely re-written as well as brought up-to-the-minute, it is a MUST for all connected with the diesel industry. ORDER TODAY.

13 is your lucky number
ONLY WHEN YOU PROTECT YOUR ENGINE WITH
WINSLOW FILTERS
1 REMOVE ACIDS
by special neutralizing agents.
2 STOP MOISTURE
at water-repellent surface, absorb residue in element fibers.
3 TRIPLE SAFETY
Patented rupture-proof double covering; element materials harmless to engine; additives unchanged in compounded oils.
4 TRAP ABRASIVES
such as gritty carbon, dust, or metal particles.
5 TOP EFFICIENCY
Channels narrow toward center, stop larger particles first, smaller ones later, hold them all.
6 FREE FLOW
Entire outside surface filters oil; spring coil core maintains free flow.
7 LONGER LIFE
Element fibers absorb impurities, straighten out, keep channels open for longer use.
8 ELEMENTS HOLD DIRT
twice, triple, quadruple their original weight.
9 RIGHT SIZE
Winslow Filters for all sizes of engines.
10 FULL-FLOW
Filters all the oil oftener, cleaner.
11 ELEMENTS FOR ALL
standard makes of filters.
12 ENGINEERING SERVICE
to meet special filtration problems.
13 DISTRIBUTORS AND DEALERS throughout the United States, Canada, in foreign nations, offer convenient service
DETAILS? Gladly. Just write to:
WINSLOW FILTERS
Winslow Engineering Company
4069 Hollis Street · Oakland 8, California

McNamara Construction Company Ltd., marine contractors of Leaside, Toronto, Ont., recently completed a new dredge that utilizes a four-engine hook-up unique in this type of equipment. The hook-up on the *Charlie M* includes four Cummins diesels powering a 12-inch centrifugal pump. The four engines operate at 1600 rpm. and develop a maximum of 600 hp. The new dredge will be used in harbor work and to deepen ship channels.

The winch and cable drum are located across the forward end of the deckhouse, and control the swing and lift of the rotary cutter. Aft of the winch, the intake pipe rises in the center section of the dredge to the Ellicott pump. The pump is connected to the power shaft with a Falk Steelflex slip coupling. Next in line on the power train is one of the gear boxes. Each gear box is equipped with a Link-Belt chain and sprocket which run in a pan of oil. The gear boxes are completely enclosed and each has its separate lubricating pump to oil each chain from underneath.

The gear boxes and the Cummins Diesel Engines are connected with Twin Disc Clutches. The four engines are set in pairs back of each gear box and along either side of the shaft. Behind the first set of engines is the second gear box with its two Cummins diesels and Twin Disc Clutches. Each pair of engines is connected to the power shaft with Thomas flexible couplings. Aft of the Cummins diesels, and also within the deckhouse, is mounted a diesel-electric generating set which furnishes electrical power for the dredge. Behind the deckhouse, on the stern of the dredge, are located two tubular pilings which are driven into the channel bottom for the purpose of holding the dredge in position. The Cummins diesels are equipped with Woodward governors, and are "keel-cooled" by water pipes that are attached to the bottom of the dredge.



McNamara Construction Company selected the four-engine hook-up used on this dredge for the following reasons:

1. It was less expensive to install this four-engine hook-up than to buy a single engine developing 600 hp. and turning at the speed of the pump.

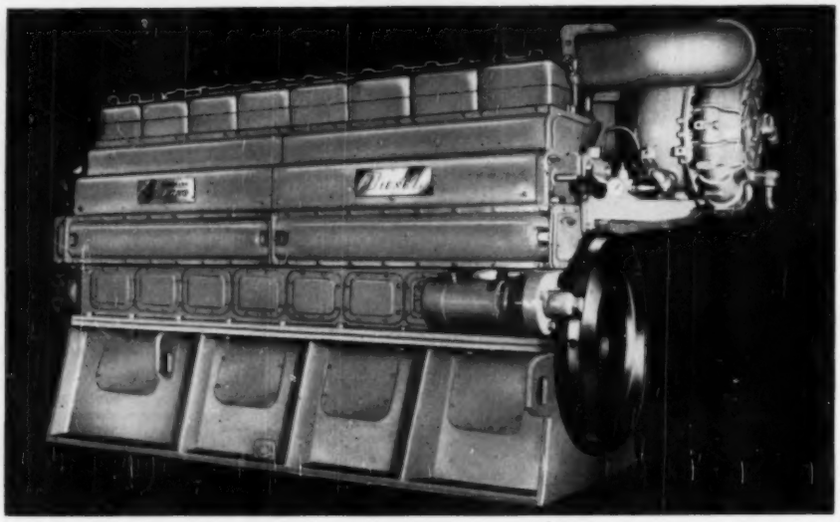
2. In the event of failure of one engine, the other three can continue the pumping operation at partial capacity.

3. The cost of replacement parts for a small engine is less than the cost of parts for a large engine.

4. Parts are interchangeable on all engines, minimizing down-time and parts inventory.

5. The engines can be removed and used in other service when the dredge is idle.

More POWER... Less SPACE
WITH
STERLING VIKING DIESELS



This 8-cylinder turbo-supercharged Viking Diesel is conservatively rated at 750 hp. Sterling Diesels are available in five different models beginning at 100 hp.

DIESEL POWER
for all
INDUSTRY

AUTOMATIC POWER PLANTS
DRILLING RIGS — HOISTS
LOCOMOTIVES — PIPE LINES
GENERATOR SETS
FISHING CRAFT — DREDGES
LIFT BRIDGES — TOW BOATS
COMPRESSORS — AIRPORTS
VENTILATING SYSTEMS
PUMPING STATIONS
SHOVELS

Sterling Viking Diesel engines offer definite advantages in:

Compactness . . . more power in less space. A high ratio of horsepower to weight.

Sturdy construction . . . one piece block and base. All working parts are easily accessible.

Dependability . . . Service records show a high operating efficiency, low maintenance cost. All Sterling Diesels are conservatively rated, built to deliver smooth performance over their full power range.

Without cost or obligation, talk over your power requirements with an **experienced** Sterling engineer. We invite your call and the opportunity to bring you up to date on Sterling's accomplishments.

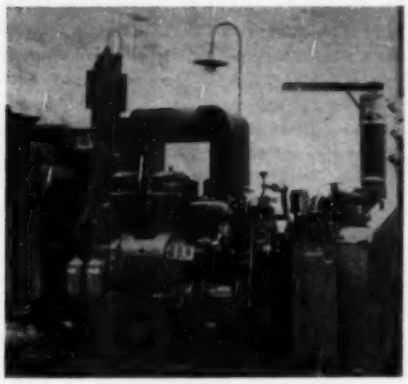
Sterling

STERLING ENGINE COMPANY

1273 Niagara St. Telephone Lincoln 0382 Buffalo 13, N. Y.

Sterling Viking Diesel Engines from 100 to 750 hp.—Sterling Gasoline & Gas Engines from 100 to 600 hp.

Unusual Oil Field Diesel Installation



In this unusual instulaltion of a General Motors Twin Diesel engine driving an oil field mud pump, a type of drive developed by Anderson-O'Brien Company, Los Angeles (GM Diesel distributors for Southern California) keeps the assembly within the eight foot width limits required for highway transport.

The drive sprocket is mounted on a hollow shaft which is carried in bearings whose outer race is supported in the heavy walls of the chain case. The engine drive shaft is extended through the hollow shaft, and supports the Fawick air clutch element.

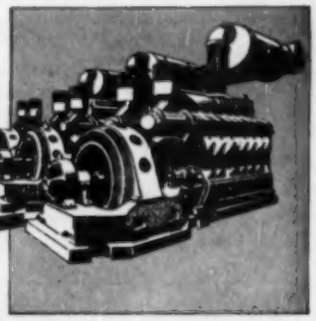
This design materially shortens the entire assembly and permits the use of an engine model with a drive shaft designed only for torsional load. Further, the Fawick clutch absorbs the shock of the mud pump chain drive, preventing the transmission of these shocks into the engine gear case. No electrical circuit is used on this engine, an air-starter benig incorporated with an unusual modification of Fulton-Sylphon shut-down controls. The engine throttle control is provided with a cam-operated air valve arranged to cut off the air when the throttle is in the "no-fuel" position. When the throttle is moved to "run" position, the valve opens and feeds air to the Fulton-Sylphone controls, one for each engine.

The standard fuel shut-off valves in the F-S controls were modified to act as air valves. Air feeds through these opened valves to the Schrader air cylinder which can be seen linked to the throttle control arm. The Schrader valve operation throwa the throttle into the "no-fuel" position when the water temperature is overly high or the oil pressure is unduly low.

Another valve incorporated into the system is opened before the throttle is moved from the "no-fuel" position prior to engine starting. The opening of this valve operates a Schrader air cylinder which can be seen above the F-S controls. The function of this is to close the valves on the F-S controls to prevent the throttle from being pushed into the "no-fuel" position due to lack of oil pressure during engine starting. This inter-connected air system leaves nothing to chance or human error, quickly shutting the engine down when the water temperature gets too high or oil too low.

Throughout the Power Industry—

Aerofin units do the job Better, Faster, Cheaper



...AND HERE'S THE STORY ON

AEROFIN

This air-pressure test is one of many tests used to control the quality of Aerofin finned heat-transfer surface. If no bubbles appear in the specially illuminated tank, it means the immersed Aerofin unit has withstood the terrific strains of steam and hydrostatic pressure tests and is ready to give you long, efficient service.

Rigid specifications and inspection, backed by more than 25 years of experience in manufacturing finned heat-transfer surface, assure you of Aerofin dependability, durability and maximum efficiency.

Aerofin is devoted exclusively to the production of finned heat-transfer surface. This specialization enables Aerofin to select just the right surface and materials for the job, and to assemble these materials into a highly efficient unit.

Day after day, thousands of Aerofin Finned Heat-Transfer Units demonstrate their superiority under the most severe conditions. Complete research has developed accurate ratings which allow you to install Aerofin at full rated capacity with confidence.

AEROFIN CORPORATION

NEW YORK • CHICAGO • CLEVELAND • DETROIT • PHILADELPHIA • DALLAS • MONTREAL

Winslow Aids State Construction

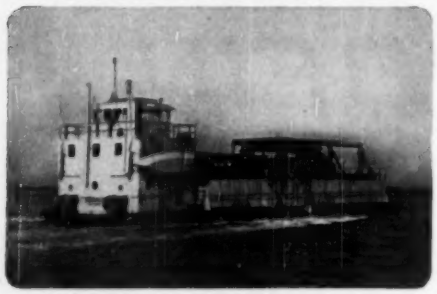
Charles A. Winslow

State aid in the construction of a chain of emergency harbors along California's 1,000-mile coastline has been called for by Charles A. Winslow, founder and president of Winslow Engineering Company, Oakland.

In an address delivered before the 22nd annual meeting of the California State Chamber of Commerce on December 1, Winslow told his Los Angeles audience that the new harbors would be a vital contribution to the safety of commercial and pleasure craft in times of stormy weather or other distress. The pioneer filter manufacturer declared that state aid would be needed because at many of the points where the harbors would be established there is neither the population nor adjoining property of sufficient assessable valuation to permit local financing.

Winslow, who has spearheaded efforts in behalf of the new facilities for the past two years, spoke in his dual capacity as chairman of the chamber's Small Harbor Development Committee and as president of the California Marine Parks and Harbor Association.

IN THE OYSTER INDUSTRY...



HARBORMASTER

equipped, the "Quinnipiac's" extreme maneuverability enables this newly designed dredge to clean and plant the oyster beds more thoroughly with about 20% of the effort.

IN RIVER TOWING...

HARBORMASTERS

powering the 597' "Cartasca" tow have conclusively proved after 3 years continuous heavy duty service the dependability and economic operation of these remote-controlled Units.

AUXILIARY TOW POWER...

HARBORMASTERS

increased the speed of the "Bull Calf" tow 1.57 mph with a full load between New Orleans and Wood River.

IN HEAVY DUTY marine fields, the Harbormaster system of outboard propulsion and steering has proved its economy and dependability. For working facts and actual case histories of the money and time saving that Harbormaster operators are daily earning, write today.

MURRAY & TREGURTHA, INC.

High Fidelity Marine Engines since 1885

28 HANCOCK STREET, QUINCY 71, MASS., U. S. A.

Diesels for Pennsylvania Railroad

The Baldwin Locomotive Works announces the receipt of an order from The Pennsylvania Railroad for a total of ninety-one diesel-electric locomotive units, including: twenty-four 750-hp. switchers; forty-one 1,000-hp. switchers; four 1,000-hp. road switching locomotives; three 2,000-hp. switchers, each comprised of two 1,000-units equipped for multiple operation; and sixteen 1,500-hp. road freight units. The aggregate value of this order is approximately 9½ million dollars.

British Concern Establishes New York Office

After investigating the American market for the past eighteen months, Associated British Oil Engines, 57 Park Ave., New York 16, have formed a New York company within the last month. They are now appointing dealers and distributors throughout the country in order to provide on-the-spot service and spare parts facilities to users of their engines.

Of particular interest is the AV2, 10-hp. Petter marine diesel, which has a marine gear box. The company has a full range of engines that are available as marine propulsion units and as auxiliary sets for marine use.

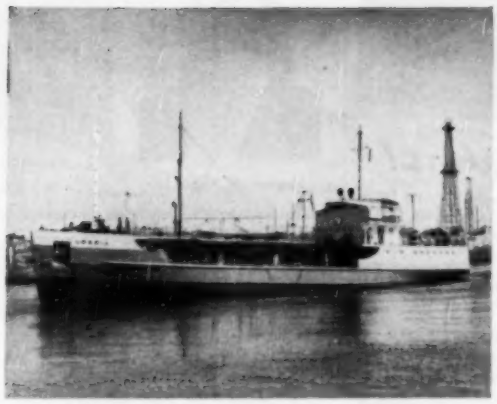
Vice President of American Bosch

Sidney E. Miller, formerly manager of the Engineering Division of American Bosch, has been elevated to the office of Vice President in Charge of Engineering, it was announced by Donald P. Hesse, President of the corporation. The election was made at a meeting of the American Bosch Board of Directors held in New York. A graduate of the University of Michigan, Mr. Miller has been associated with American Bosch since 1944, being formerly connected with the Frigidaire Division of General Motors.

Since coming to American Bosch, Mr. Miller has been active in various manufacturing and engineering capacities which culminated in his appointment in 1948 as head of the corporation's engineering division. Mr. Miller is a member of American Society of Automotive Engineers, American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

Service Representative for Cummins

Jack Mitchell, Service Manager for the Hibbing, Minn., branch of Cummins Diesel Sales Corp., for the past several years, has been promoted to Service Representative of the Great Lakes Region of Cummins Engine Company, Inc. His new headquarters will be the Great Lakes Regional Office, Cleveland, Ohio. Mr. Mitchell has all-around experience in the application of diesel engines to automotive, industrial and marine power jobs. The years he spent on the Mesabi Iron Range in Minnesota — the testing ground for heavy-duty equipment—have given him experience that will be particularly valuable to users of Cummins Diesel Engines in the states and provinces making up the Great Lakes Region: Indiana, Ohio, Michigan, Ontario, Nova Scotia, Quebec and Newfoundland.



URANIA

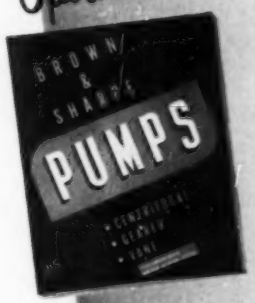
Engine room equipment including:

• MAIN PROPULSION ENGINE • PUMP SET
• GENERATOR SET • COMBINATION SET

Supplied by **UNION** *Diesel*

The UNION DIESEL ENGINE Co.
2200 EAST SEVENTH STREET
OAKLAND 6, CALIFORNIA, U. S. A.

For Trouble-free Diesel Operation...



Send for a copy of this Catalog and see how many quality-built Brown & Sharpe Pumps are available for diesel use. A wide range of types and sizes in standard rotary geared pumps with various styles of special mountings greatly simplifies the right selection for the job. Have a catalog handy for quick reference. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

WIDE SELECTION PERMITS THE RIGHT CHOICE

We urge buying through the Distributor

BROWN & SHARPE BS

YOUNG ANNOUNCES...

AN IMPROVED LINE OF SHELL AND TUBE BUNDLE HEAT EXCHANGERS

Offering Durability at Low Cost

Young, pioneer manufacturer of heat exchangers and other heat transfer products, now offers greater savings in initial and maintenance costs with its newly designed heat exchanger line. Corrosion-resistant Admiralty tubing, larger tube sizes, and engineered tube spacing and baffling mean longer service, easier maintenance. Coupon brings full details, without obligation.

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HEAT TRANSFER PRODUCTS FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS.

HEATING, COOLING, AND AIR CONDITIONING PRODUCTS FOR HOME AND INDUSTRY.

T. M. REG. U. S. PAT. OFF.

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DEPT. 100-A, RACINE, WISCONSIN
Plants at Racine, Wisconsin and Mattoon, Illinois

DISCOVER FOR YOURSELF NEW HEAT TRANSFER ECONOMY

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Rush me the facts about your ☐ Fixed ☐ Removable Tube Bundle Heat Exchangers, without obligation.

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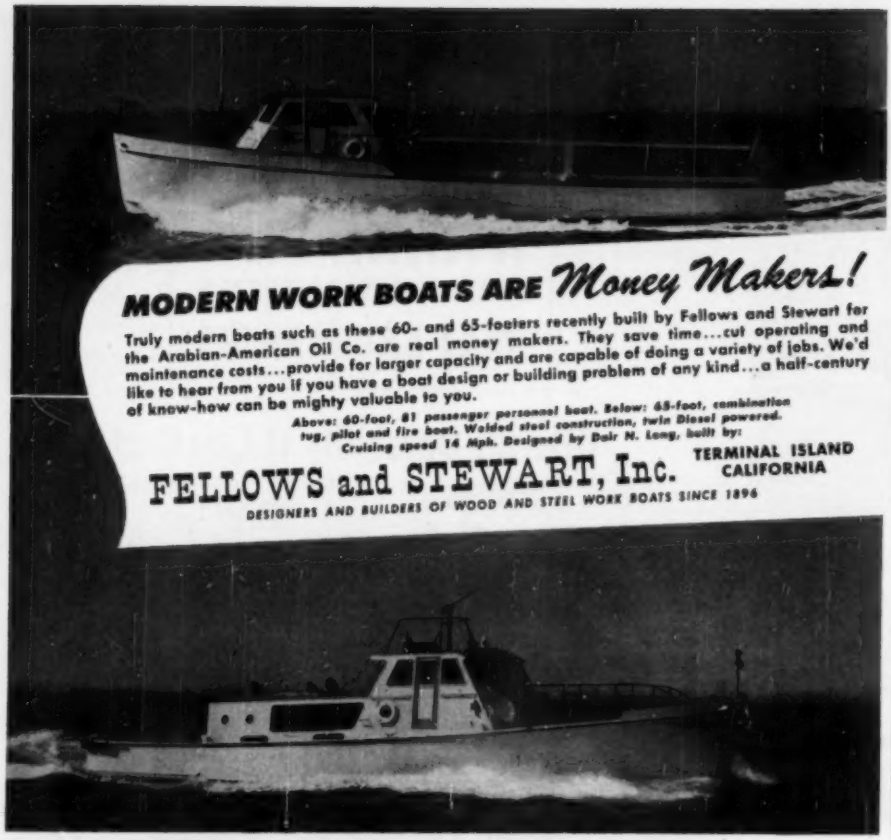
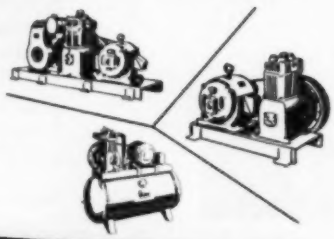
City _____ Zone _____ State _____


MODERN WORK BOATS ARE Money Makers!
Truly modern boats such as these 60- and 65-footers recently built by Fellows and Stewart for the Arabian-American Oil Co. are real money makers. They save time...cut operating and maintenance costs...provide for larger capacity and are capable of doing a variety of jobs. We'd like to hear from you if you have a boat design or building problem of any kind...a half-century of know-how can be mighty valuable to you.
Above: 60-foot, 81 passenger personnel boat. Below: 65-foot, combination tug, pilot and fire boat. Welded steel construction, twin Diesel powered. Cruising speed 14 Mph. Designed by Dair N. Long, built by:
FELLOWS and STEWART, Inc.
TERMINAL ISLAND CALIFORNIA
DESIGNERS AND BUILDERS OF WOOD AND STEEL WORK BOATS SINCE 1896

Quincy COMPRESSORS STANDARD CHOICE OF
LEADING DIESEL MANUFACTURERS

Diesel starting requirements demand dependability and durability. Quincy Compressors are standard with leading diesel manufacturers because Quincy features assure dependable performance . . . long, trouble-free service life. Quincy Compressors are available in a wide variety of sizes 1 to 90 cu. ft. displacement, up to 500 lbs. discharge pressure. Units available as illustrated at right. Quincy manufactures air compressors exclusively.



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Dept. K-10, QUINCY, ILLINOIS
Branch Offices: New York • Philadelphia • Chicago • St. Louis • Dallas • San Francisco

Chief Engineer for Purolator

Herbert R. Otto, Jr.

Herbert R. Otto, Jr., formerly assistant chief engineer, has been appointed chief engineer of Purolator Products, Inc., Newark, N. J., manufacturer of automotive oil filters and other filtration equipment, it was announced recently by Jules P. Kovacs, vice-president of Purolator in charge of engineering.

After graduating from Stevens Institute of Technology, Hoboken, in 1938, Otto joined Purolator as a service engineer. He is a member of the American Society of Mechanical Engineers, Plainfield, N. J., section.

Big Shovel on the Move

A Lima-Hamilton diesel switcher pulls cars loaded with components of a Lima-Hamilton Type 2400 shovel for delivery to a West Virginia contractor. The mammoth shovel has a capacity of 6 cubic yards and will be used for stripping coal. The shovel is powered by a Hamilton 6-cylinder, 8¾ by 12 diesel, developing 400 net horsepower, and the locomotive diesel is a Hamilton 8-cylinder, 9 by 12 engine, pressure-charged, with 1,200 net horsepower. Both diesel engines are built at Lima-Hamilton's Hamilton, Ohio, plant. The shovel and locomotive are built at Lima-Hamilton's Lima, Ohio, plant.

Automatic Engine Controller

The new Universal Automatic Engine Controller is offered in cubicle construction, completely enclosed, but with all parts accessible, and protected from moisture and dust. The relays are mounted on a separate panel which can be removed without disturbing other parts of the controller. The controller can now be located away from the engine, providing more room for engine manipulation. The Universal Automatic Engine Controller can be arranged to start the engine by means other than drop in pressure in the system. Push buttons at remote locations, switches energized by the opening of deluge valves, impulses received from fire alarm systems or failure of electric power in the plant can be utilized to actuate the controller, and shut down may be automatic or manual.

Sales and Service Manager at Bendix

A. J. Poole, Sr.

Scintilla Magneto Division of Bendix Aviation Corporation recently announced the promotion of A. J. Poole, Sr., to Sales and Service Manager of Diesel Engine Products.

Mr. Poole, who has been associated with Scintilla since August, 1931, was born in London, England. Receiving his education at King Henry VIII School and Coventry Technical Institute, Coventry, England, he has concentrated much of his time and energy in the automotive and diesel fields.

He joined the Bosch Magneto Company, where he held the position of Assistant Chief Engineer, later becoming Branch Manager of the Eastern Division.

From 1917 to 1923 he was Sales Manager for Simms Magneto Company. At that time he rejoined Bosch as Manager of Manufacturers' Sales, introducing their fuel injection equipment to the American diesel engine manufacturers.

Joining Bendix Aviation Corporation in August of 1931, in 1945 he was loaned by the corporation to the U. S. Government as an investigator in the automotive field in Germany. He returned to Scintilla in 1946. A past vice president of the Society of Automotive Engineers, he has been a member of that organization since 1910.

Savings Effected by Diesel-Electric Locomotives

Three years ago, Maryland Slag Company purchased a General Electric 65-tone diesel-electric locomotive for hauling slag. Two years later, pleased with the operation and savings effected by this unit, the company bought two more similar industrial locomotives. Now the conversion from steam power is being made complete with the purchase of an 80-ton G-E locomotive for the company's Lordstown, Ohio, plant. The G-E units haul slag from the dump pits directly into the crushing mills. Each locomotive averages 16 hauls of slag daily, with five cars each time. Each carload of slag weighs approximately 33 tons.

Maryland slag officials say the diesel-electric locomotives are much cheaper to operate, through reduced fuel and maintenance costs, and will do more work than steam locomotives in less time.

New Bulletins on Cummins Diesels

Two new bulletins containing complete specifications of all automotive and industrial models of HR-600 and HRS-600 Cummins Diesels have been announced by the Cummins Engine Company, Inc. These four-cycle, six-cylinder Cummins Diesels have a 5½-in. by 6-in. bore and stroke, and a piston displacement of 743 cubic inches. The naturally aspirated HR-600 develops a maximum of 165 hp. at 1800 rpm., and is available in six models for use in all types of highway and off-highway automotive applications, and a wide range of industrial uses, including power units. The supercharged HRS-600 Cummins Diesel is offered in five models adapted to both automotive and industrial power jobs of all types of conditions.

Each bulletin includes general specifications, a list of standard equipment for each model, together with optional equipment. The bulletins are illustrated with installation drawings and photographs of the various models, plus drawings illustrating torque, horsepower and fuel consumption curves. Bulletin No. 5287 (HR-600) and Bulletin No. 5289 (HRS-600) may be obtained from Cummins dealers or by writing the Cummins Engine Company.

Diesel Engine Catalog is just off the press in its Fourteenth Edition. See the unique Diesel Horsepower Range Chart — invaluable aid to design engineers and buyers. ORDER COUPON ON PAGE 77.

A 6500-Hour Grind
BUT PRACTICALLY NO WEAR!

The Van Dusseldorp Construction Company of Colfax, Iowa, used only D-X Diesel Motor Oil and D-X High Speed Diesel Fuel in the operation of a GMC 371 Diesel Engine in a Unit dragline. After 6500 hours of hard use under severe conditions, the engine was taken down for routine inspection.

Look At These Amazing Inspection Results!

After 6500 Hours:

Only .0005" wear on the Crankshaft!

No perceptible wear on the Piston Pin!

Only .0025" wear on the thrust side of the Cylinder Liner!

Piston Rings still serviceable!

Intake Ports of liner still clear!

No fouling or sludge in the Crankcase!

That's Why More Diesel Operators Specify

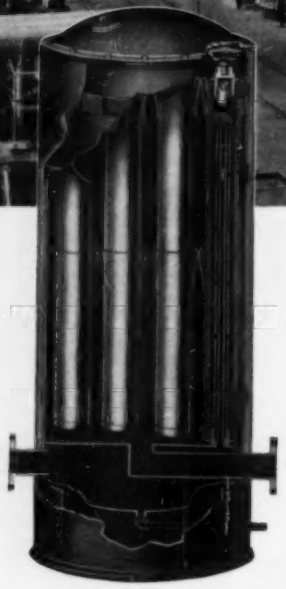
D-X *Diesel* MOTOR OIL

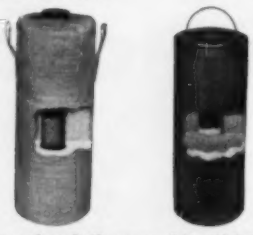
Records like that of the Van Dusseldorp firm prove conclusively that D-X Diesel Motor Oil gives your Diesels the protection you need in heavy duty Diesel operation. D-X distributors and bulk stations are located throughout the Middle West. Call or write the D-X branch office nearest you for information, prices and terms.

MID-CONTINENT PETROLEUM CORPORATION
TULSA, OKLA.

Waterloo, Ia. Terre Haute, Ind. Chicago, Ill.
Omaha, Nebr. Minneapolis, Minn.

In this plant Honan-Crane Purifiers are direct connected to twenty-four 1,000 HP Cooper-Bessemers; nineteen 1,000 HP Worthingtons and eleven 1,450 Rathburn Jones engines . . . a total of 68,950 HP.





Honan-Crane Purifiers are available with both single and multiple cartridge-type, quick-change refills . . . using either cellulose fiber, or fullers earth purifying media.

Specify HONAN-CRANE Oil Purification for DIESELS

Proven Design Increases Safe-Use Life of Oil . . . Cuts Maintenance Costs

Honan-Crane Oil Purifiers are the choice of leading Diesel operators and engineers for purification of lubrication oils in Diesel Engines.

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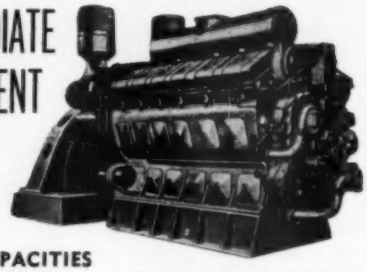

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Plants and Warehouses: Jersey City, N. J., Sausalito (S. F.), Calif.

G-E Diesel-Electric School

As widely used as is the diesel-electric locomotive, it is still a relatively new form of motive power. For this reason, many manufacturers of diesel engines and diesel-electric drives are sponsoring schools to teach the fundamentals of operation, service, and maintenance.

These schools are conducted in the interests of the customer or prospective customer, to insure better service and longer life of the equipment. Primarily, the schools are designed to give the operating and maintenance personnel and service engineers a greater understanding of the construction and operation of all forms of diesel-electric motive power so that they may be better qualified to do their work.

An example of this type of school is the one being held by General Electric in its Erie, Pa., plant. Here, G-E's Locomotive and Car Equipment Divisions offer instruction in operation, inspection and maintenance of that company's switching locomotives.

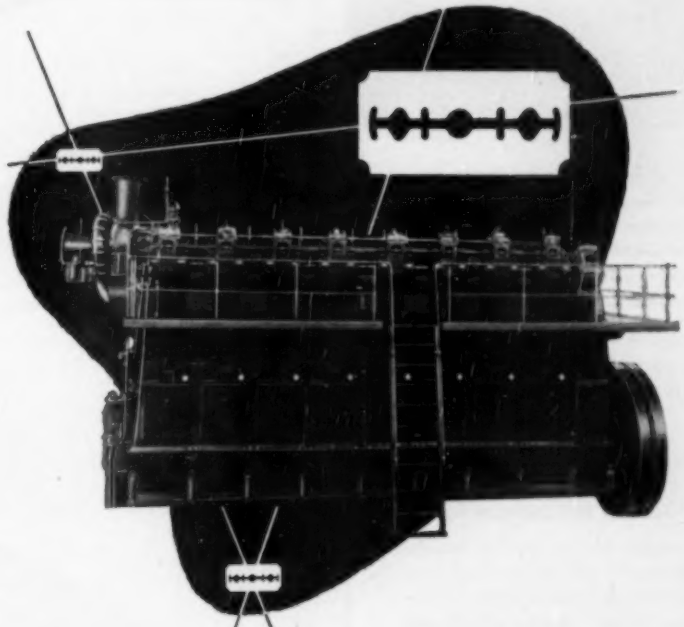
G-E's program is tailored particularly for the personnel who will be working on the locomotives when they are in service. The classes are kept small, with a limit of about 20 people to a session. In this way instruction can be personalized and kept flexible enough to meet the needs of the individuals in the class. The school lasts a week and is offered free of charge. Selection of personnel to attend is made by the customer, who pays for the student's traveling and living expenses. There is no charge for enrollment, tuition, or books.

Advancement in Diesel Engine Structure

John L. Ostborg

Members of the Kansas Association of Municipal Utilities were given an overall view of the advancement in diesel engine structure at a meeting of the group in Wichita last month. Their speaker was John L. Ostborg, assistant chief engineer of the Superior Engine Division of the National Supply Company, whose diesel plant is located at Springfield, Ohio. Mr. Ostborg has been engaged in this phase of engine design since he joined the company in 1938. His talk was titled, "Diesel Engine Architecture." Although a portion of Mr. Ostborg's address was devoted to the history of diesel engine development, and the efforts of American engineers to improve and modify the early European designs, the National Supply representative also noted that todays' designs were established with an economical power output of 1,000 horsepower. With the successful manufacture of reliable superchargers now accomplished in the United States, he believes that the gradual upward climb of piston speeds and higher pressure supercharging may ultimately bring 5,000 horsepower to a 16-cylinder engine of moderate bore and stroke.

Good engineering is still the most successful key in producing a good diesel, Mr. Ostborg told his audience. The man who is first of all a mechanical engineer, giving thought to the stresses and strains a working engine must endure, then to accessibility and form, will produce an engine which is a pleasure to look upon, and which will earn the loyalty of the man with the wrench. Engine architecture, the speaker noted, was in part related to the prevalent usage of outside supplies. To remain in a competitive position today, the average engine builder must take advantage of all accessories and engine components available on the open market to produce an engine which is low in cost per horsepower, easily and quickly serviced, and which enjoys long life. Mr. Ostborg said: "These requirements do not always produce an engine which lives up to the power block concept, but in the hands of a skilled designer the components can be welded into a whole which is truly distinctive and admirable."



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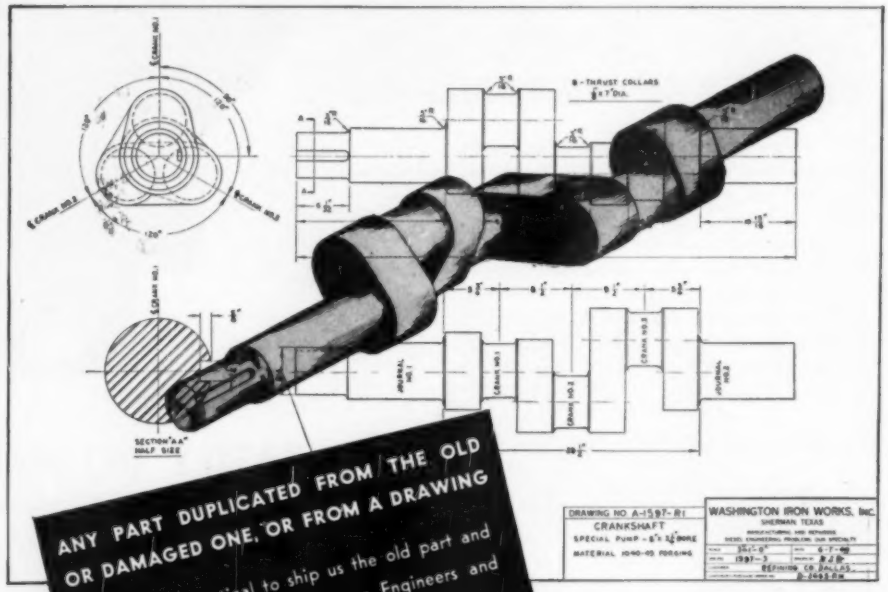
Diesel Starter Fluid

After more than a year of on-the-road and field operation tests, Sinclair Refining Company has placed on the market a patented diesel starter fluid. This fluid, which is being offered in gelatin capsules and cans, is designed to eliminate the use of heaters and electric boosters heretofore required for starting in cold weather. Where the mechanism for priming diesels is mounted on the dashboard, the fluid in capsule form is most desirable, as it enables the operator to start without the help of a second person injecting priming fuel into the engine, thereby effecting a saving in labor as well as operating expense.

Since a large percentage of automotive and contractor diesel equipment is kept out of doors, engines must be started where they are. Prior to the introduction of this fluid it was the practice in many places to keep equipment running at idling speed to maintain engine temperatures and provide ready availability. This causes excessive engine deposits, sludge and sticking fuel injectors with resultant increased maintenance costs and shortened engine life. With Sinclair Diesel Starter Fluid, this practice can be entirely eliminated and disruption of schedules and loss of production where engines cannot be started entirely avoided. This fluid is available through Sinclair distributors.

BREAK DOWNS need not be prolonged!

Illustration shows crankshaft from custom built pump in large Shortening and Soap Manufacturing Plant.
Original shaft failed in service and delivery time from factory was expressed in terms of **MONTHS!**
The broken shaft was received in our shops on MONDAY—drawings were prepared, work started and a completely new crankshaft—accurately machined from a solid forging—was ready for delivery the following **SATURDAY!**
Months of costly waiting reduced to SIX DAYS.


ANY PART DUPLICATED FROM THE OLD OR DAMAGED ONE, OR FROM A DRAWING
When not practical to ship us the old part and drawings are not available, our Engineers and Draftsmen will visit the location to prepare drawings and discuss repair procedures, when justifiable.
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CRANKSHAFT

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SHERMAN, TEXAS

Portland (Oregon) Orders 32 Mack Diesel Buses

A $550,000 order for 32 diesel buses has been placed with Mack-International Motor Truck Corporation by Portland (Oregon) Traction Company. Scheduled for service by February 25, 25 of the vehicles, of 45-passenger capacity, are slated for general use on the company's routes; seven, with 37 seats, will be run on especially hilly lines. All of these buses will feature the Mack diesel engine, Fortress Frame, Evenflow automatic heating and ventilating system and hydraulic torque converter drive. Delivery of the new equipment will make possible the retirement of the last street cars operating on Portland's streets.

New Bulletins by Baldwin

How to apply SR-4 Strain Gages, Bulletin No. 279-B, is announced by The Baldwin Locomotive Works. This eight-page bulletin gives detailed procedures for attaching SR-4 resistance wire strain gages to surfaces and is illustrated by 18 cartoons animating the strain gages to show their reactions to correct and incorrect methods.

Instructions are given for surface preparation, cementing, clamping, heat drying, moisture-proofing, and testing of gages after bonding in order to assure proper application. These instructions include the variations of methods developed for four general classes of gages and to alternate methods of application.

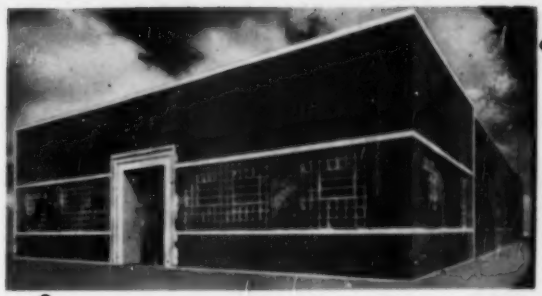
In conjunction with the bulletin 279-B, Baldwin has available the bulletin 279-A, which describes the uses of SR-4 Gages for stress analysis, and tells how to select and use these gages. It explains the fundamentals of both simple and practical strain gage circuits and instruments, illustrating eight circuits and eight different types of instruments.

Instruments range from a Wheatstone bridge control box to oscillographic equipment and automatic self-balancing indicators and recorders, and include switching units for multiple gage installations. A section on "Calculation of Gage Output" gives derivations of formulas for computing simple dynamic circuits and Wheatstone bridge circuits, and includes examples of these computations.

Superintendent of Motive Power

Appointment of J. H. Heron at St. Paul as Great Northern Railway superintendent of motive power, effective December 1. He succeeds J. L. Robson, who recently was named the railway's general superintendent of motive power.

Heron has been assistant to the general superintendent of motive power since 1945. He joined Great Northern as draftsman in St. Paul in 1936, became fuel supervisor at Spokane in 1938 and shop superintendent at Great Falls in 1941. During World War II he served with the Military Railway Service. New assistant to the general superintendent of motive power in St. Paul is R. A. Smith, who has been Spokane division master mechanic.



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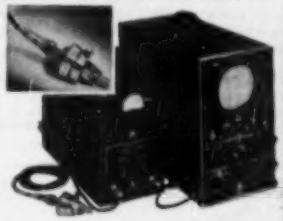

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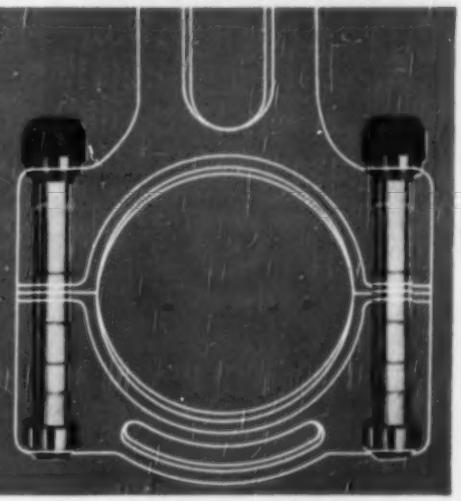

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A diesel engine parts rebuilder formerly hand brushed his injector nozzles in kerosene and repaired them for $36.00 per set of six. The injector screens were discarded.

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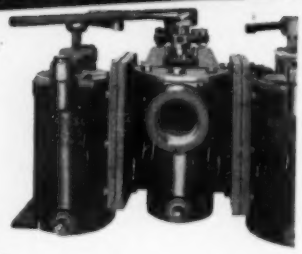

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With Kraissl Separators, you entirely eliminate your normal filter replacement costs. Baskets are instantly—and easily—changeable. No tools are needed. Magnet equipped baskets available for lubricating lines—and other installations, where metallic particles are a source of trouble.

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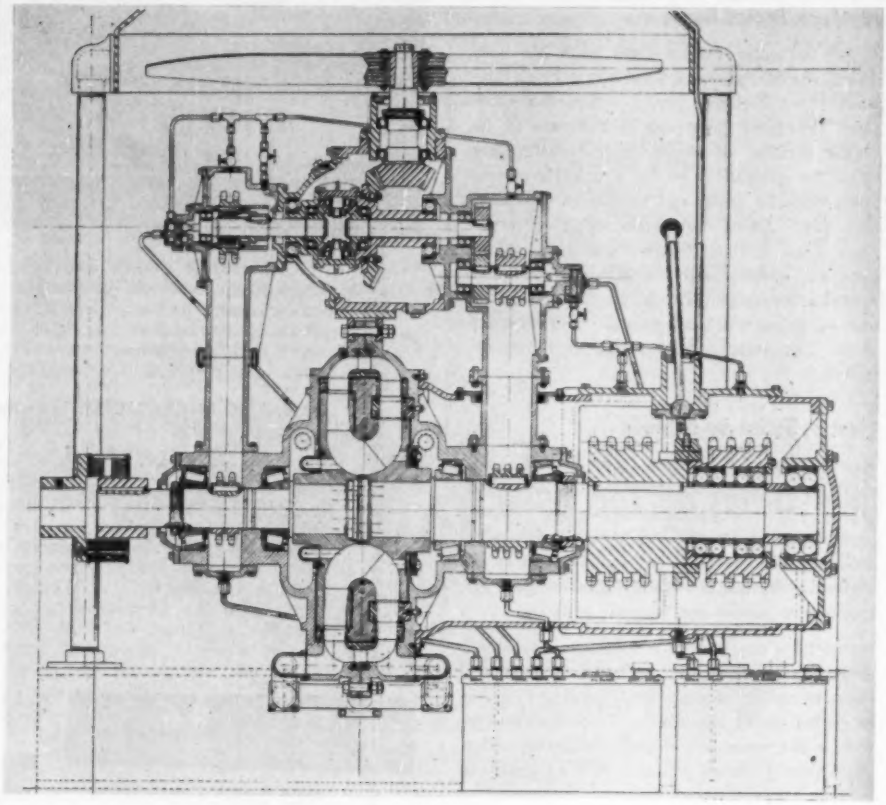
NEW AXELSON TORQUE CONVERTER



IN LINE with its 50-year policy of developing better equipment for the petroleum industry, the Axelson Manufacturing Company has recently acquired an exclusive manufacturing and sales license for the C. M. O'Leary patents and hydrokinetic torque converter drives. Designed for use with oil well drilling rigs, the first model, to be known as the "T-30," which is rated at a maximum of 600 hp. at 900 rpm. and a minimum of 350 hp. at 800 rpm., is already in the process of manufacture.

Future plans call for the Axelson-O'Leary torque converter to be built in four sizes for the petroleum drilling industry. Two high speed types rated at 130 hp. to 300 hp. at 1600 rpm., and 250 hp. to 575 hp. at 1600 rpm.; two low speed types rated at 175 hp. to 450 hp. at 900 rpm., and the T-30 mentioned above.

Outstanding features claimed for this new Axelson product include high efficiency due to air foil blading, the method of mounting the turbine and reaction blades which combined with the forward-and-reverse-flow fluid circulating system and an automatic cooling system permits the torque converter to be successfully used as a brake. The automatic cooling system permits the torque to be operated at the stall of the output shaft for an indefinite period without raising the fluid temperature in the converter above its normal operating range.

In oil well drilling operations, this new torque converter can be used as an automatic weight control and will feed the drill bit only as fast as the bit is capable of making a hole, the weight on bit being controlled from the engine throttle setting.

When using the torque converter as a brake, the rate of descent may be controlled to any speed desired and the drill pipe may be brought to a complete stop by engine throttle control without the use of a manually operated brake. A torque and efficiency indicator is placed within easy view of the operator and will indicate when a shift to the next speed is needed to obtain maximum horsepower delivery to the load.

In addition to this new line of torque converters Axelson also has in this design stage a new automatic four-speed forward, two-speed reverse transmission for use on drilling rigs. This unit may also be set for manual control. In the automatic range, the transmission will shift progressively up or down as the torque load on the torque converter increases or decreases throughout four-speed ranges.

Sales and distribution plans for these new Axelson products have not as yet completely matured but several methods are being investigated. Arrangements have been made for field testing the first models produced in the next few months. Complete engineering information on these products is now being prepared, and anyone desiring this data should contact Axelson's home office at P. O. Box 98, Vernon Station, Los Angeles 11.

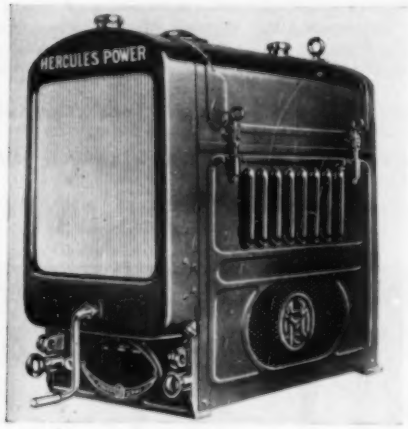
Manufacturing Manager for Westinghouse

R. H. Timmons

Mr. Ray H. Timmons has recently been appointed manufacturing manager of industrial products for Westinghouse Electrical Corp. In his new position, Mr. Timmons will have broad staff responsibility for supervising and coordinating manufacturing of a wide range of industrial products such as meters, transformers, motors, and generators. Mr. Timmons formerly was manager of manufacturing for the company's Transportation and Generator Division at East Pittsburgh.

Mr. C. M. Clark, formerly superintendent of manufacturing for the Transportation and Generator Division, will succeed Mr. Timmons as manager of manufacturing for that division.

Three New Hercules Power Units

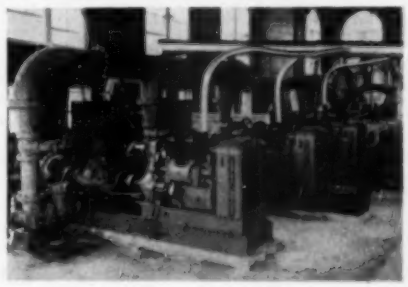


With the addition of three new 4-cylinder gasoline power units to its line, Hercules Motors Corp. provides power users with a broader choice to more economically meet their specific power needs. This places Hercules in a position to offer the trade one of the most extensive lines of gasoline and diesel power units ever made available by one engine builder.

The power units are designed for high speed, heavy duty service in every industry where portable power can be used to advantage. The oil fields, mining industry, construction field, rock products industry, and agricultural industry will particularly find these sizes indispensable in either of their open, closed or base type mountings. The new engines follow definite standards of design and construction established by Hercules as practical in meeting the service to which these power units are subjected. They are equipped with five main bearings and the crankshaft is counterbalanced for smooth, vibrationless operation, and to reduce bearing loads. The crankshaft is also Tocco hardened to permit the use of bearing metals of relatively hard and long life. The high turbulence design of the combustion chambers in the cylinder head provides maximum power delivery and operating economy. Exhaust valves have austenitic heads welded to hardened nickel steel stems. This design offers exceptional resistance to burning and oxidization and maintains valve head strength at elevated temperature.

Diesel Standbys for Auxiliary Power

The favorable acceptance of modern diesel engines for standby and auxiliary power in municipal water systems is due in part to the important savings in space and installation costs that can be effected through their use, according to V. C. Genn, General Sales Manager of the Detroit Diesel Engine Division. These savings are brought about because of the smaller size and lighter weight of these engines and the smaller space required for the storage of the fuel. They are far out-shadowed in size by the old steam engines and boilers they sometimes replace.



As an example of size in relation to power, Mr. Genn refers to GM Twin-Six diesel unit which is only 93 inches in length—56 inches wide and 58 inches high, and yet provides emergency pumping power for the entire City of Beaumont, Texas, with a population of 59,000. Important considerations in the selection of this engine were the limited space available and the fact that no extensive foundations were required.

Another such unit is in the pumping station of the St. Louis County (Mo.) Water Company. Although this installation is used only as a standby unit and for periods of peak loads, it is capable of pumping 463,000 gallons of water per hour with a Worthington "250" pump.

Three single six GM diesels were recently installed by the Water Department of Pontiac, Michigan. The diesel engines on these units occupy a floor space of only 64 inches by 32 inches each and yet the three units driving Peerless pumps are capable of producing 9,720,000 gallons of water a day, Mr. Genn said.

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Flexible ALL METAL
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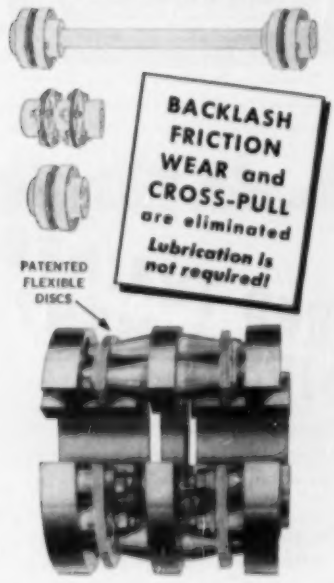

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  Detroit Diesel Engine Div.
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Hallett Manufacturing Co.
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Hercules Motors Corp.
Hill Diesel Engine Co.
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DIESEL

New Building for Miami Branch of G M Diesels

A new building added to the Miami branch of The Florida Diesel Engine Sales of General Motors Corporation now provides expanded service and parts facilities for GM Series 71 Marine diesel engines. Measuring 60 ft. by 56 ft., the new shop houses equipment of latest design, including modern engine overhaul stands, a complete injector test and repair department, gas and electric welders, valve grinding machines, etc. A 350-ft. marine railway provides for haul-outs of boats. When engine removal is desirable truck or crawler cranes are used to transport the engine from the dock or marine railway to the new service building. Altogether, very complete facilities for GM diesel engines are thus provided for pleasure craft, work and fishing boats in this important marine center. In charge of the Miami branch is John B. Huglen, who is assisted by Gertrude E. Buchanan, William E. Hutchings, Gordon E. Fox and a staff of factory trained mechanics. Headquarters of Florida Diesel Engine Sales is at Jacksonville, Florida, under the direction of E. G. Duerk.

Promotions at Cummins Sales and Service

Earl G. Ellis

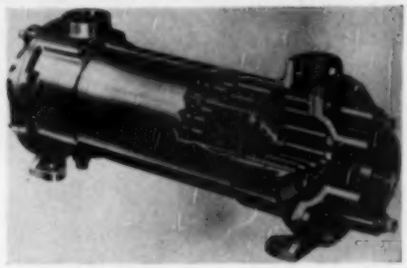
The promotion of Earl G. Ellis to General Service Manager and A. C. Zugar to sales engineer have been announced from the Fort Worth headquarters of Cummins Sales and Service, Inc., by President J. E. Everroad. Ellis, former export service manager stationed at Caracas, Venezuela, is headquartered at Fort Worth. Zugar, formerly at the Odessa service point, is at the new and modern factory type service shop at Oklahoma City.

Ellis has been with the company since 1941, where he started in the diesel department at Odessa. In 1943 he was transferred to the Houston branch and was promoted there to shop foreman in 1944 and to district service manager in 1945.

A. C. Zugar

Zugar came to Cummins Sales & Service, Inc., in 1946, after 3½ years in the Army Air Corps at Houston as a member of the diesel department. In November, 1947, he was transferred to Odessa, where he became specialty salesman in 1948. Before coming with Cummins Sales & Service, he was affiliated with Shell Oil Company, Franks Mfg. Company, Helmerick & Payne Drilling Contractors and Skelly Oil Company.

Stainless Steel Exchange



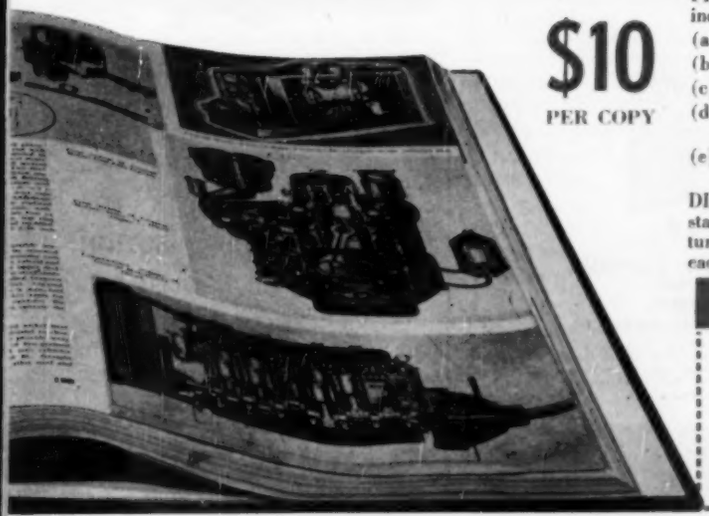
The first all-stainless steel heat exchanger to reach mass production is announced by Ross Heater & Mfg. Co., Inc., Buffalo 13, N. Y. Immediate delivery and low unit cost of this new model are made possible, states the manufacturer, by complete standardization and stocking of all component parts.

Identical in design and capacities to the well known Ross Type BCF exchangers which are all-copper and copper alloys, the new model, Type SSCF, utilizes stainless steel to avoid contamination of fluids or corrosion by fluids. The SSCF series incorporates all recent advancements in Ross thermal engineering, according to the manufacturer, and is offered in a complete range of sizes tested to 450 psi to withstand most strenuous usage. While type 316 stainless steel is standard, due to its almost universal acceptance in industry, SSCF exchangers can be made also from any of the other well known types of stainless steel, although such special orders lose the benefit of immediate shipment.

ENTIRELY REVISED AND REWRITTEN!

ENGINE CATALOG

VOLUME 14 1949 EDITION



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(b) An accessory section describing engine and plant accessories.
(c) A transmission section—a new feature in this volume.
(d) A classified buyers' guide—"Market Place," covering Diesels, accessories, transmissions and other allied products.
(e) A large advertising section. Manufacturers' advertisements carry a wealth of information for design and purchasing engineers.

DIESEL HORSEPOWER RANGE CHART: This catalog includes a new and startling chart showing horsepower ranges of diesel engines classified by manufacturer. By giving at a glance the range of horsepower ratings of the engines offered by each firm, it is a new and valuable aid to all connected with the Diesel Industry.

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P A R T S

WEST COAST DIESEL NEWS

By FRED M. BURT

STAR OF SAN PEDRO, seiner skippered by Tony Trutanich, was repowered with a new Enterprise DMX-6, 250-hp., 400-rpm., diesel engine by Harbor Boat Bldg. Co., Terminal Island.

FELLOWS & Stewart, Terminal, have recently supplied 165-hp. Gray diesel engines for five shrimp boats working out of Puerto Penasco, Mexico—Hector Rojas' 40-foot trawler; Marcelo Pino's *Ytza;* Lionel Velasquez' *Priscilla;* Carlos Venagas' *Bonito Juarez.*

POWERED with a 4-cyl., 55-hp. Gray diesel engine is the new 33-foot troller *Dora Marie,* built at the CRPA Shipyards, Astoria, for C. F. Damon of Bay Center, Wash.

BUILT by the Jacobsen Yard, Seattle, 54-foot seiner *Scandia,* one of the fastest vessels in the Puget Sound purse seiner fleet, is powered with a 171-hp. at 900-rpm. Buda diesel which turns a 46x33-in. through a Twin Disc 2:1 reduction gear.

THE *Verna Marie,* a northern 55-foot fishing vessel recently acquired by Pan-Pacific Fisheries, Inc., Terminal Island, and powered with a 175-hp. General Motors diesel with 3½:1 Snow-Nabstedt reduction gears, was sold to Clarr Deetz, San Pedro.

THE Havenstrite Mining Co., in Candle, Alaska, for building lighting and operation of small motors, have installed two Caterpillar 25-kw. diesel-generating sets, each with Engineering Controls' Vapor Phase units to produce low pressure steam for heating with unit heaters.

BUILT by Sagstad Shipyard, Seattle, for John Marincovich, Everett, Wash., 57-foot purse seiner, *Cheryl Ann,* designed by Edwin Monk, Naval architect, is powered with a 165-hp. General Motors diesel.

SAN FRANCISCO dragger *Dorothy Ann* has been re-powered with a 125-hp. Atlas diesel at Parker Diesel Engineering Co., Oakland, for Joe Balestrieri & Co., owners.

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THE 10-year-old *Invader*, towboat owned by Tidewater-Shaver Barge lines, has been rebuilt with a new steel house, two 970-hp. Cooper-Bessemer diesels and other completely new equipment at the Russell moorage, Vancouver, Wash., as a result o fbeing burned to the deckline in May.

NEW diesel engines recently serviced by Cummins Sales and Service, Los Angeles, include 14 Cummins automotive units for Diamond T, Mack, Sterling, Autocar, Peterbilt and Kenworth trucks; in the same period, nine Cummins diesels sold principally for use in the same makes of trucks.

FOR installation in their trawler, *Catherine Paladini*, a Model 375 Caterpillar marine diesel, 270-hp., 8-cyl., with blower, purchased by A. Paladini, Inc., San Francisco sea food producers; also a 4:1 Snow-Nabstedt reduction and reverse gear, and 3:1 Twin Disc gear for front power take-off.

RECENT work at Joe Dardin's Boat Shop, Eureka, Calif., new 47-foot combination boat with 165-hp. GM diesel; 50-foot combination boat *Ranger*, 115-hp. Caterpi 'ar diesel; combination boat *Sea Amber*, 165-hp. GM diesel.

THE 73-ft. tugboat *Frank G. White*, powered with a model DMG-8 Enterprise 475-hp. diesel engine, built for the Board of State Harbor Commissioners, Port of San Francisco, at Pacific Coast Engineering Co., Alameda, and Anderson & Cristofani shipyard, San Francisco, designed by Bethlehem Steel Co. Shipbuilding Division, with naval architects Guralnick & Biesemeir as consultants, will be used to keep San Francisco's water front free of mud.

DESIGNED by Ed Monk and Lorne Garden, Seattle naval architects, a 42 by 13 ft. tug for Alaska Packers Association recently completed at the company's Blaine, Wash., yard, is powered with a 90-hp., 4-cyl. Atlas diesel.

THE 62-ft. salmon seiner *Marie Rose*, built for Matt Ivanovich, Gig Harbor, by Pacific Boatbuilding Co., Tacoma, is powered with a 150-hp. Lorimer diesel with 2:1 reduction gears; engine and auxiliary gear supplied by Cliffe Mathers.

Jacksonville Orders 100 Mack Diesel Buses

Asserting that his action would "give Jacksonville the finest bus service in the nation," Wiley Moore, president of the Jacksonville (Fla.) Coach Company, recently signed an order for 100 Mack diesel buses to become part of the city's fleet of 211 vehicles.

Designated as Model C-45, these Mack diesel buses incorporate many advanced design features, among which are the company's all-steel frame; Mack's own 672 cu. in. diesel engine paired with the Mack torque converter, which is especially designed to eliminate jerky acceleration; the Mack Evenflow system which automatically controls heating and ventilation; and, for increased passenger comfort, staggered seats.

Diesel Engine Catalog is just off the press in its Fourteenth Edition. See the unique Diesel Horsepower Range Chart — invaluable aid to design engineers and buyers. ORDER COUPON ON PAGE 77.

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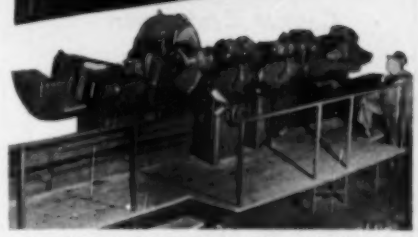
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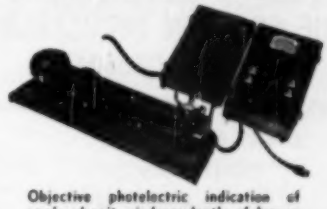
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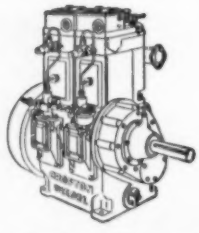

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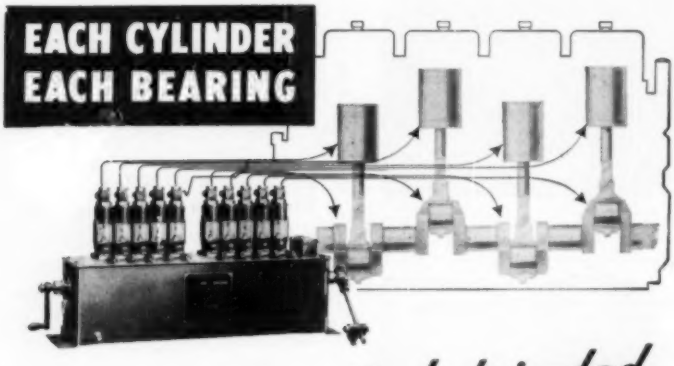
ADVERTISERS' INDEX

Adeco Products, Inc.	79
Aerofin Corporation	65
American Bosch Corporation	21
Associated British Oil Engines, Inc.	22
Brown & Sharpe Mfg. Co.	67
Burgess-Manning Co.	24
Centrifugal Foundry Co.	59
Cities Service Oil Co.	18
Cleveland Diesel Engine Div., General Motors	6
Columbia Electric Mfg. Co.	76
Cooper-Bessemer Corp.	Fourth Cover
Crofton Diesel Engine Co., Inc.	80
Detroit Diesel Eng. Div., General Motors	12
Electro-Motive Div., General Motors	7
Electro Products Laboratories, Inc.	73
Elliott Company	Third Cover
Enterprise Engine & Foundry Co.	15
Erie Bolt & Nut Co.	73
Erie Forge Co.	20
Fellows & Stewart, Inc.	68
Fitzgerald Manufacturing Co., The	80
Fulton Iron Works Company	71
Griffin Equipment Corp.	78
Hemphill Schools, Inc.	76
Honan-Crane Corp.	70
Hunt-Spiller Manufacturing Corp.	4
Illinois Testing Laboratories, Inc.	10
International Harvester Co.	8
Kraissl Company, Inc., The	74
Lister-Blackstone, Inc.	62
Mack Trucks, Inc.	2-3
Madison-Kipp Corp.	17
Magnus Chemical Co., Inc.	74
Manzel Brothers Co.	80
Mid-Continent Petroleum Corp.	69
Murray & Tregurtha, Inc.	66
National Forge & Ordnance Co.	78
National Welding & Grinding Co.	79
Nordberg Mfg. Co.	16
Nugent & Co., Inc., Wm. W.	57
Oakite Products, Inc.	72
Petrometer Corp.	79
Photovolt Corp.	79
Pickering Governor Co.	79
Purolator Products, Inc.	70
Quincy Compressor Co.	68
Schoonmaker Co., A. G.	70
Shawmac Silencing Corp.	78
Standard Oil Co. of California	5
Standard Oil Co. (Indiana)	9
Standard Pressed Steel Co.	78
Sterling Engine Co.	64
Stewart & Stevenson Services	19
Sticht Co., Herman H.	78
Synchro-Start Products, Inc.	60
Texas Co., The	Second Cover-1
Thomas Flexible Coupling Co.	75
Tide Water Associated Oil Co.	13
Union Diesel Engine Co.	67
U. S. Hoffman Machinery Co.	79
Walworth Co.	14
Washington Iron Works, Inc.	72
West Coast University, Hemphill Diesel & Automotive Schools Dept.	78
Winslow Engineering Co.	63
Worthington Pump & Machinery Corp.	11
Young Radiator Co.	67

EACH CYLINDER EACH BEARING



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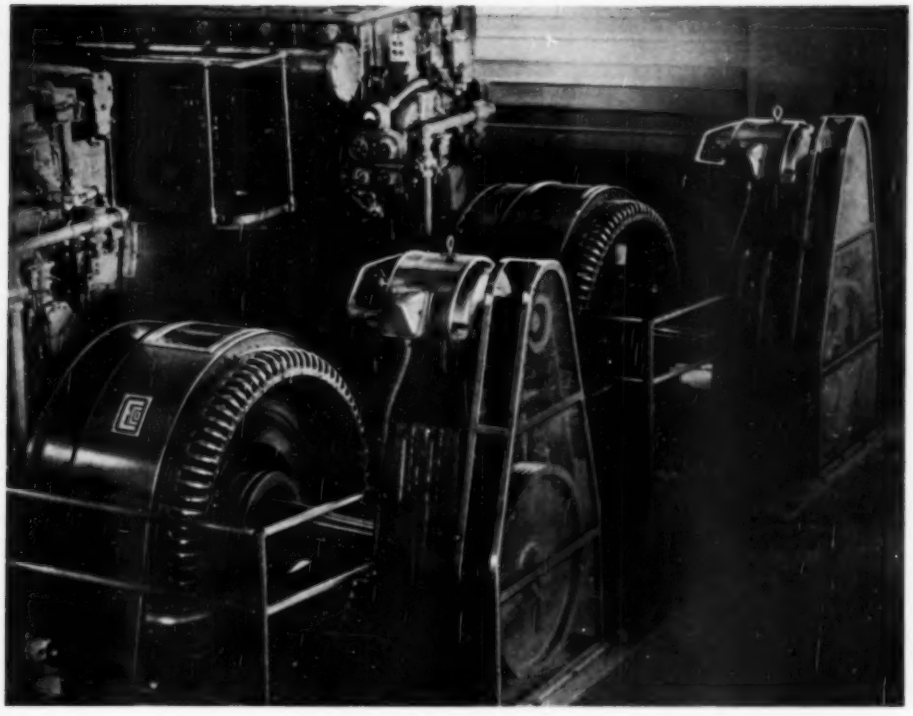
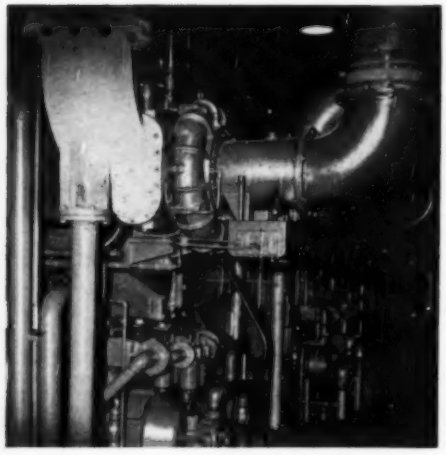
GRAHAM COUNTY *looks ahead*



The Elliott 800-kw generators with V-belt-driven exciters in the new installation at the Arizona 17 Graham plant.

An ARIZONA community with plenty on the ball



Elliott-Buchi turbochargers provide ideal conditions for their Diesels to develop maximum power in the two units recently added to the Arizona 17 Graham plant. The three earlier units will also be turbocharged.

IN the Upper Gila River Valley they not only believe in plenty of electric power, but also in educational efforts to drive home its advantages to outlying farms and ranches.

To keep ahead of power demand the Graham County Electric Cooperative, Inc., recently installed two units in addition to the three already operating. The new units have Elliott 800-kw flywheel type generators which team up admirably with their dual-fuel Cooper-Bessemer Diesels to deliver minimum-cost kilowatts to a network of local lines. To further insure performance that rings the bell on economy, Elliott-Buchi turbochargers on the engines give them ideal combustion conditions and complete scavenging.

Graham County needs more power, so the three supercharged engines will also get Elliott-Buchi turbochargers to step up their output an estimated 700 kw. Two more generators, an 800-kw and a 600-kw, will be installed on the existing engines.

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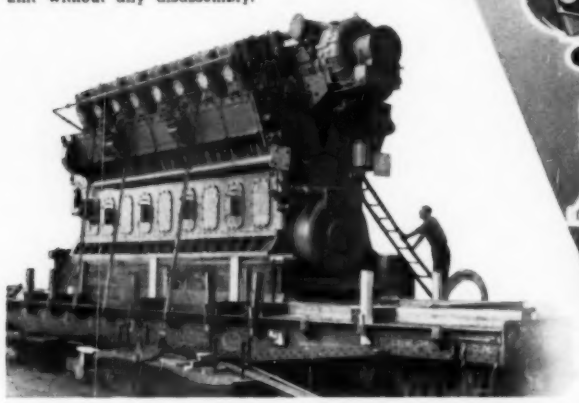
RIGHT: cross-section of Cooper-Bessemer LSV diesel (15¼" bore, 22" stroke) showing rugged, compact design and articulated connecting rods. Features include, large 13½" diameter counterbalanced crankshaft, unusually low bearing pressures, and exceptionally low head room.

BELOW: Cooper-Bessemer 16-cylinder LSV engine, rated 3,400 hp at 327 rpm, mounted on flat car ready for shipment. As shown, complete factory-tested engine can be shipped as a unit without any disassembly.



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